Hints to Inventors

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HINTS TO INVENTORS

TELLING WHAT INVENTIONS ARE NEEDED, AND HOW TO PERFECT AND DEVELOP NEW IDEAS IN ANY LINES

BY

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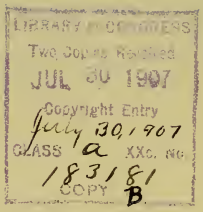

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DEDICATION

TO

JOHN E. SWEET

Formerly Professor of Mechanical Engineering, Cornell University;
Ex-President American Society of Mechanical Engineers

AS A HIGH TYPE OF THE

PATIENT, PERSISTENT, SYSTEMATIC,
PRACTICAL INVENTOR,

AND IN

SLIGHT RECOGNITION

OF HIS

ESTIMABLE PERSONAL QUALITIES

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These last three are not proposed in earnest, but merely to end the dry list pleasantly.

XXXIII. INVENTIONS FOR WHICH PRIZES ARE OFFERED.

Introduction to the First Edition

THIS volume is to some extent a republication of articles of the author, some of which appeared in the *Sunday World*, and others in the *Practical Mechanic*, and which were intended to do inventors a twofold service: first, to warn them from fields in which remuneration was not likely to come from inventions, because either the art was so well advanced, or there would not be sufficient demand for even a perfect invention; second, to point out lines in which inventions are greatly needed, and in many cases loudly demanded, hence should pay.

In the publications named the author gave quite a number of hints which presented themselves to him in the course of his perambulations and thinking-fits; and since then there have come up about as many more, which it would be well for him (and her also) of ingenious mind and practical training to produce.

In looking over the broad field of indus-

try the intelligent observer is struck with two things: first, the high degree of pecuniary reward which has been attained by those inventors who have gone to work to supply something that the world needed; second, the great number of lines in which there is still opportunity for inventors to succeed.

The mere fact that there is already a successful machine or process in use need not deter an inventor from making a better one. The history of the sewing-machine, the typewriter, the mower and the reaper, and a hundred other inventions, shows that when people are once aroused to the desirability of having a thing done better than before they are greedy for still more and further progress. Every invention cannot or will not be that which is brought out first. The rest have a good show, and sometimes a better one, by reason of what has been done by the pioneer. The author would say to every inventor, whether or not yet successful, Keep on inventing; only be sure to get up things which are needed, and do not waste your time in converting people to

the idea that what you have invented is what they want. If they do not know that they want a thing, and do not call for it, never mind about producing it as long as so many things are still unfurnished which they do want, know that they want, and for which they keep on calling.

New York City.

Introduction to the Second American Edition

THIS edition, published many years after the first (now out of print), is so long delayed because since a short time after the appearance of the first the author has lived almost uninterruptedly in Europe, where he has been much too busy to prepare for America more than the most necessary literary work. In the last few years, however, he has put out two editions of a similar German work. The first of these, "300 Winke für Erfinder," was a much augmented translation of the original American one; the second, "450 Winke für Erfinder," is still further enlarged by numerous valuable suggestions in response to letters and postcards to important representative European firms, asking if there were in their various respective lines any inventions which they regarded as desirable. From time to time, also, inquiries for machines, processes, and products have reached him

from "God's country." Nearly all of these are here embodied. Some of the inquirers for special inventions have already been notified that what they called for stood at their disposition. Many of the problems posed have been solved. Most of them are capable of more than one, some of them even of several, both technically and commercially practical solutions.

The author will be glad to give his readers, at any time, whatever information is in his power concerning inventions already matured, or possible markets for properly protected ideas. He begs to be excused, however (in view of the great number of insufficiently prepaid letters addressed to him from America), for remarking that letters requiring an answer should enclose a five-cent stamp for reply, and be prepaid at the rate of five cents for each quarter of an ounce of their weight, and that short-paid letters and unpaid packages will be refused.

Hannover, Germany, September, 1906.
Fundstrasse 30.

Chapter I.

ELECTRICAL*

Of course the first lines in which there appear to be opportunities for successful invention are those in which electricity and its myriad appliances are made to do man's bidding.

One of the greatest of all electrical problems that is just now offered for solution is the production of electricity direct from coal without the intervention of a steam boiler and engine; without the incidental production of light and heat. Whoever does this successfully should become "rich beyond the dreams of avarice." This may call for the production of a primary battery which shall use ordinary coal as one of its electrodes, oxidizing this perfectly to carbonic acid, without the production of heat — and all at a cost which will render such production of electrical current a commercial rival with the present method of using the coal in a furnace to produce steam with which to run an engine by which to turn a "dynamo" which shall evolve the current.

The storage battery or secondary battery — particularly for vehicles — is far too heavy, complicated, costly, and liable to deterioration, and gives

*See also the chapter "Inventions for which Prizes Are Offered."

off fumes which do not commend it to popular approval. There is ample opportunity for inventors to do good and paying work here.

If some scientist — or any one, in fact — will invent a way of storing up lightning and using it when and where it is needed, he will make for himself more than a mere name.

Electro-deposition needs looking into. There are several metals which as yet cannot very well be deposited by the galvanic current; and the art of depositing alloys has as yet but very limited practical application.

Electric cooking has been but little more than suggested. In many houses now having electric lights a good device for cooking by electricity taken from the same wires which supply the light could very readily be introduced.

The problem of electric transmission of power has been solved by several methods, more or less (generally less) satisfactory. This field is a wide one, and the incentive to effort very great.

Can you make a better filament for the incandescent electric light than those which you see? Or can you even make as good a one? If so, you can practically dictate your own terms for the sale of your patent.

There is a big demand all over the country for an insulating-material for wires which would be light, cheap, easily handled, and not readily altered or attacked by heat, cold, dampness, acids, alkalies,

coal-gas, or sewer-gas, and which would also resist abrasion.

A telephone exchange in which each subscriber could catch and hold any other in the system without resort to "Central" is not so impossible of production as might at first seem.

Those who have spent a half-hour or so trying to ring up a man at the other end of a telephone line and have found out after much effort that there was no one there would feel better if there was on the market something which would at once, when a box was rung up, give a signal stating that there was no one to receive a message and would not be until a time which would be stated by the attachment.

Long-distance telephoning is only in its infancy. There is need of greater certainty of working and of greater clearness of sound.

Telephoning and telegraphing at sea may seem wild. So did sending a message along through a wire without pulling the wire. There are people now living who will send a telegraph from one vessel at sea to another; or to port.

[The above was written in 1891 and published then in newspaper form; in 1892 it appeared in the first English edition of this work. Since then, Marconi, d'Arco, Slaby, and others have wrought wonders in long-distance wireless telegraphy. Wireless telephoning at long distances seems now (August, 1906) still among the unsolved problems.]

How long will it be before the stern-posts of great steamships will be made by electric welding? [Thermit welding of such pieces seems a great success.]

Up to date the electric accumulator — and especially that offered for use on carriages and power bicycles and tricycles — is by far too heavy, complicated, expensive, short-lived, and evil-smelling. Here is an excellent chance for inventors to solve a problem that has not engaged as much attention as it deserves.

The much-desired accumulator must be suitable for street-railway purposes, and be able to be developed for the use of interurban railways. The overhead system, although offering the great advantage of cheapness of original outlay and of maintenance, is very unwelcome to fire departments and insurance companies, as, not satisfied with being a source of fire, it is a great hindrance to the use of fire-ladders; so that despite its cheapness, simplicity, lightness, and rapidity of construction and repair, it must eventually go "where the woodbine twineth." But its successor must pass a much more severe examination than is usual with inventions offered for public acceptance. The desired accumulator must be much lighter than its predecessors that have been tried in public; must not lose its liquid contents by reason of the inevitable shaking that it will undergo on the average track — to say nothing of ordinary roads if it is used for road vehicles; must emit no gases that are dangerous to

life or property, or even unpleasant to the passengers; and it must not take so much time in loading as the present ones. Its units must not be so large or so heavy that they will be difficult to handle, as in changing at the end of a trip. In several types the jarring of service shakes the compound from between the plates and thus ruins the cells. This is of course to be got around — most easily, perhaps, by using horizontal plates. Further: the new accumulator must not be freezable even in a North Canadian temperature; and, finally, it must not require the attendance of Lord Kelvin, Herr Kapp, or other world-wide celebrity to keep it in good condition.

A paint for the interior of accumulator-boxes is still among the desirable things in electrical lines. It must be highly resistant to sulfuric and nitric acids, and other chemicals used in filling the accumulator, and be easily put on.

It is quite possible that, while the accumulator of the future will replace the overhead wire conductor system, there will for a long time yet be experiments made as regards underground conductors for power, and especially for interurban railways. This would effect a saving in fuel, lubricant, wages, and interest on permanent way and rolling-stock.

But the new underground conductor must be much better than the present ones. The system must be able to be used alone and in combination with steam traction, not only where the latter is used

on connecting lines, but where the service is mixed electric and steam. That means that the new system must not require a special track, but the trains with steam traction must use the same rails.

It must be of such simplicity and character that it can be introduced on a line already having steam traction, without interfering with either the local or the through traffic, at least as regards the passenger traffic, even for a few hours; and its introduction must not interfere much even with the freight traffic. The desired system must be neither expensive nor complicated. By this the author means that it must not be necessary, as is the case with one system seriously proposed some time ago, to have an iron pot every yard or so along the track, filled with magnets and complicated mechanisms. If such contrivances be necessary, they must not be nearer together than at present is the case with the rail-joints — say every thirty feet. The system must not be interfered with by snow, overflows, or rain, and must be so simple that an ordinary workman can put it in order and make slight repairs thereon, without special appliances that cannot be carried in an ordinary handbag During tests and experiments and the carrying-out of light improvements the traffic must not be disturbed — with the exception of reaches of track not more than four rails long. The rail-joints must be of such character that no sawing, planing, or filing is necessary on the track itself; all such work must be done in the rail-mill,

or in some shop, ready for the rails to be laid and joined. If possible, the rails and fish-plates should not be different from those used for steam traffic on the same road. Further: the entire system must not make any complications with the telegraph or telephone system, or with the electric handling of switches or signals. A further condition is that the system shall be unaffected by lightning and that it shall offer no special danger to human life or to property, even when struck by lightning. The plant and connections must be durable, and the annual repair-bills light. Spare parts must be cheap and easily obtained and inserted; and be so light that they can be carried on the repair-car. These spare pieces must be "standard,"— that is, the same for all lines,— so that if two different lines come under the same management after being equipped, repairs will not be unduly complicated by the necessity of having on hand two sets of stock.

The only way in which it seems possible to arrive at such a perfected system is for the different railway managements to combine and build an experimental track on which tests can be made under experts paid by such combined management — just as the various electric companies in Europe have formed a "*Studiengenossenschaft*" to test, at joint expense, various methods of rapid electric traction.

As yet the electro-deposition of aluminium on other metals, as well as that of other metals on al-

uminium, has not been accomplished to the satisfaction of those most interested.

A very desirable process would be one by which aluminium could be permanently and satisfactorily electroplated with pure gold.

An apparatus for the transmission of facsimile writing and drawings would be welcome to all newspaper publishers, as well as to the police, as it would be capable of sending sketches of localities and portraits of criminals or celebrities. It would be especially desirable to be able to use this apparatus in connection with the ordinary telephone conductors. Steps in this direction have already been made, but up to this writing — August, 1906 — there has been nothing offered the buying public; capitalists are about the only ones as yet who have cognizance of the inventors' progress — and failures.

Gutta-percha — which is quite a different thing from caoutchouc — has as an isolating-material for electricity the very undesirable quality that it softens by heat, so that copper wires insulated therewith in cables and more simple conductors do not remain central. As this material is dear, and gets dearer every year, and as this is also the case with India rubber, it is desirable to find therefor a cheap and efficient substitute.

The electromotors which are offered for use by the average power-user run, for most purposes, too fast. Besides the need of slower ones, there is room for small ones, as well made as the large ones, which

will deliver from 1–50 up to 1–20 horse-power, and which have controllable speed. They should, for the present at least, be wound for the ordinary 110-volt current found in the usual household lighting-system.

For the best manner of avoiding the danger of touching a high-tension conductor by a low-tension wire, in the case of transmission by alternate current, prizes are offered by the dynamo-manufacturers and others most concerned.

Chapter II.

CHEMICAL

The problem of the continuous fractional distillation of petroleum often has been offered to all those who should be most interested in its accomplishment as a very desirable one to solve. At present, a still is filled and made to yield so much of one compound, then so much of another, and so on until it is empty, when it must be cooled and recharged. What is wanted is a still or apparatus which will work as a flour-mill does,— receive constant feed of raw material and deliver constant streams of the various products and by-products.

There are many mineral hydro-carbons which it would pay to "vulcanize" as India rubber and gutta-percha are now.

What is not known about "vulcanizing" India rubber, gutta-percha, and other similar substances would fill a large volume. Get up a process for recovering India rubber out of old vulcanized articles, and another for vulcanizing the material so that it will not get soft by heat nor brittle by cold.

In the manufacture of emery-wheels, a bond is desirable which will possess the advantages of both India rubber and silicate.

Can you make leather which shall be as pliable

as ordinary leather and shall wear as well as rawhide? If so, you can borrow money on the process.

We cannot yet imitate Russia leather cheaply and well. Inventors take note.

The metallic sheen which is seen on liquid aniline colors, and which seems at times to be such an objection, should be taken advantage of. Inventors should aim to produce fabrics having various colors and a metallic lustre.

The chemist who can make aniline dyes permanent will confer a great boon upon the community and should line his pockets well with bank-notes.

In the manufacture of artificial precious stones the French have done a good deal; but for the inventor to have the right to be proud, the diamond and the pearl should be made as successfully as the turquoise and the ruby.

The chemist who will produce an artificial mica in large sheets will find buyers waiting for his patent or process.

The discovery of special foods for special parts of the body, in like manner as now applied for different crops, is worth seeking.

The dread disease pulmonary consumption, and that other equally fell destroyer, cancer, have never been subdued by specifics, and whoever produces medicaments which will cure them will deserve well of his fellow men, and should reap a fortune.

Some time when you have leisure produce an artificial coffee or tea flavor which shall be as like the

real as artificial vanilla is like the flavor which it imitates.

Can you take the nicotin out of tobacco without injuring the other flavoring principles which it contains? If you can you will be a benefactor anyhow, and perhaps a millionaire.

Why don't you invent a good process for making sugar from sorghum or imphee?

Sugar (that is, saccharose) from starch will come some day — when we know how to produce it. Whoever finds out ought to get rich. Making glucose from starch has paid handsomely, but making sugar from the same substance should enrich inventor and manufacturer.

Match-making needs a little impulse. Can you get up a fusee which will not blow out and which will not smell like a drug-store on fire?

A cheaper process of making pure cream of tartar than those at present employed should bring wealth to its inventor.

There is always a good chance for new explosives, particularly if they are controllable and make no noxious gases.

A process by which the water of great rivers may be purified more rapidly than by filtering-beds should command attention and a high price.

Can you take all the smell out of kerosene-oil? If so, you know how to do what many manufacturers have been trying to do for a long time.

The chemist who will make from cottonseed

either a drying or a non-drying oil should not want for cash if he manages his affairs properly.

More cements for fastening metals to glass would find room and sale.

No one seems to have been able, as yet, to preserve eggs fresh and sweet for a long time, as fruits are kept. Some one will manage it some day and reap a reward therefor.

Inventors should get at the matter of the manufacture of artificial ice. What is needed is a machine which will make ice, first, safely; second, cheaply; and third, without using chemicals which have to be imported.

A good indelible canceling-ink for postage-stamps has been the aim of inventors and the desire of the post-office authorities for many years, but has not as yet made its appearance. When it comes it will not have to create a demand; the demand is already here.

A jet-black ink which will be black when written with, will stay black, will not corrode a steel pen, and will flow freely is one of the things that everybody wants.

A copiable typewriter ink, that will be black after copying as well as before, is desired.

There is as yet no decent aniline black color. There are blacks which show through them a green or a brown or a blue color, and others which are even bronze when the light falls upon them a certain way; but the real "black black" is not on the market, nor even on the road to the market.

The so-called "indelible" ink for marking linen seems to live up to its name only when the articles marked therewith are washed at home. Directly the laundries get hold of the clothes the ink-marks disappear, and usually with them the cloth where they were. A black writing-ink which would withstand the severe bleaching-materials used in the laundries would sell well.

It would seem as though whoever got out an odorless house-paint that would cover well and not disintegrate under the influence of the weather would find it very easy to dispose of.

There seems to be insufficient field for the utilization of chlorate of potash.

Nearly pure carbon — say 99.5 per cent — in large blocks would find ready sale.

A simple manner of collecting the carbonic acid generated in the fermentation of brewers' and distillers' mash would find ready sale. The consumption of the gas in compressed form is already large, and is rapidly increasing.

For use in the ice and cold brine machines in breweries, cold-storage warehouses, etc., there would be a ready market for a liquid that was inexplosive and not suffocating in gaseous form, and would not attack iron.

Brassware manufacturers seek a coloring-liquid which will blacken the finished goods while keeping them "matt." The manufacturers of microscopes, opera-glasses, surveyors' instruments, etc., need such a material daily.

As a rule, blacking for men's shoes contains acid and eats the leather. A blacking which would yield a real black with a high polish and contain some harmless substance to replace the sulfuric or acetic acid now used ought to take well when once beyond the probation stage.

If we observe the real Gobelin tapestry we will see that the original greens and yellows have faded proportionately much more than the other colors. In some originally very valuable pieces these two colors have entirely disappeared. This is because the yellow dye used at the time of manufacture of the original Gobelin work was not permanent; nor is there yet on the market one good permanent yellow dye for textiles.

Paraffin wax is a very useful material, especially in rendering vessels water-tight, but has the disadvantage of being combustible. A solvent therefor, which would produce a solution that was uninflammable, would be of great use in the industries — as for instance in the manufacture of dry batteries.

Celluloid is a very useful material, which has worked its way by sheer worth into thousands of articles of daily consumption, and has produced large sums for its inventor and manufacturers. It has, however, three very great disadvantages: it is highly — even dangerously — combustible, requires in its manufacture camphor (which is getting dearer every day), and smells of this latter substance. Several materials have been offered as substitutes for

the celluloid, no one of which, however, replaces it for more than a few of the many purposes for which celluloid is used. Milk is the raw material of one of these; potato pulp, that of another. The industrial chemist could find few better fields in which to work.

Asphalt, used so universally for street-paving (where dishonest contractors do not substitute the much less desirable coal-tar), has a very disagreeable smell which it would be a good idea to eliminate.

Artificial rennet for the manufacture of cheese would sell well. It would also find application in the household.

To prevent butter from becoming rancid, without causing it to lose its characteristic taste, odor, and color, or injuring its digestibility, would be a problem worthy the chemist's attention.

The presence of fusel-oil (largely composed of amylic alcohol) in brandy, and more especially in whiskey (that made from potatoes is the worst in this respect), is most undesirable, as the taste is unpleasant and the so-called "oil" is poisonous. Distillers seek a suitable process by which its presence may be prevented in the distilled spirit, or if that cannot be accomplished, by which it may be removed without great trouble and expense, or without the expenditure of too much time in "ripening."

Vinegar made from wood has a most unpleasant taste; and while this does not prevent its being used

in many industries, it shuts it almost completely out of household use. It is very well worth deodorizing.

Carbon disulfid, used in the manufacture of India-rubber goods, has the advantage of being the best known solvent of caoutchouc, and the disadvantage of having a most disgusting smell. This latter quality shuts it out of use for many industrial purposes — to say nothing of its application in the household as a solvent of grease. Who will render it inodorous?

For many industrial chemical purposes aluminium cannot be used, as it is attacked by many of the acids in the chlorine series, many of which contain more or less nitric acid as impurity. Here there are two ways out of the difficulty: either to produce an aluminium alloy that would not be attacked by these acids, or to invent a process by which the acids may be produced on an industrial scale, free from nitric acid.

Who will invent a process by which ordinary brewers' yeast shall be produced as a mass which shall be free from the taste and smell of beer (preferably white in color) and can be compressed into cakes and wrapped in tin-foil for bakers' and household use? The product must preserve its fermenting-qualities unaltered in any climate, and stand transportation.

There are two processes that would pay well if they filled all the requirements. The first is the

substitution of something for the India rubber used in making stamps; the second, or alternative, is to "vulcanize" the India rubber itself without the use of steam. The resultant "vulcanized" mass must not harden with cold or age, nor soften under the same influences.

Among the many really necessary inventions is one which will keep ordinary "soft rubber" soft and good in all climates, and for at least four years. Any one who has remarked how elastic ribbons such as are used in men's suspenders, in elastic stockings, etc., get worthless in two years, or less, will see where such an invention would come into play.

For the manufacture of "denatured" alcohol — that is, alcohol which has been rendered absolutely undrinkable, and which is in many countries untaxed — there is desired a substance that is disgusting in taste, so as to make any beverage made from the alcohol "denatured" therewith absolutely undrinkable, without being poisonous, but which would not make the alcohol smell disgusting either when in the liquid state or in evaporating or burning. At present "pyridin" seems to have the most extended application.

The manufacture of calcium carbid calls for a very great expenditure of electricity. The rapid development of the industry despite this disadvantage is, however, a proof that a cheaper cost of manufacture would bring tremendous success.

So-called "solid alcohol" we have already; but petroleum and benzin rendered similarly available for safe transportation and use have not yet appeared.

For the preservation of lumber against decay no fully suitable material has been discovered. At least those which would preserve the wood, once they were therein, cannot be made to penetrate into the interior of the pieces to be impregnated, or if they do reach the inner portions they are readily washed out by the action of water or even of the weather. In this particular the Germans have proved themselves the best chemists, and the Americans have produced the most effective apparatus for forcing the impregnating-fluids into the pores of the wood. But there is much left to be done in both matters. The desired material must not discolor the wood, if this latter is to be used for interior house-building purposes; must leave it inodorous; must not increase its inflammability; if possible, should render it practically incombustible, and should have no action on nails driven into the wood, glued joints therein, or paint used thereon.

A cheap process for manufacturing cyanide of potassium is loudly called for.

An inexpensive manner of deodorizing some sorts of petroleum — as for instance that from Texas, Lima, O., Canada, and Russia — would be a great boon, as it would make these oils available for use in lamps, and render them less harmful to the iron of boilers under which they were fired.

We have meat extracts of all sorts, liquid and pasty; but who will prepare a good article of dried or otherwise preserved milk, free from sugar, that will be thoroughly soluble in water or in coffee and tea? The milk powders that are on the market are not fully soluble; they curdle. The trade would readily take two varieties of dried milk — with and without cream — that is, dried unskimmed and dried skimmed milk. Both must, however, possess all the above-named qualities, and keep well in any climate for any length of time. The process must not affect the digestibility, even in the stomachs of young children.

There are on the market many preparations of margarin and similar substances; what is further needed is a process of making out of tallow a wholesome food product.

The secret of the varnish which the violin-makers in the seventeenth century used seems to have died with them. That it had a great and most favorable influence on the tone of the instruments on which it was used, violin experts are unanimously agreed; and among them there are no two opinions as to the desirability of rediscovering the compound. Unfortunately, the experiments must be only synthetical; for no one would permit the analysis of the varnish on a violin having a worth of ten thousand dollars — which, for example, was the price paid by Colonel Partello for one of his famous instruments.

There is only one factory in the world — it is in

Germany — that has succeeded in producing a good artificial indigo; and to bring this on the market has required the outlay of an immense capital for the necessary plant to produce the materials called for. The industry is one which brings in millions.

As the so-called "smokeless" gunpowder nearly suffocates those in the neighborhood of the yellow vapors produced, and as the half-burned particles discharged from the muzzle of the gun are, to say the least, highly unpleasant if they fly in one's face, it would seem as though there was a good opportunity for some capable industrial chemist to hand his name down to fame by inventing a "Smithite" or a "Jonesite" or some other "ite," in the neighborhood of which those using it, or near where it is being used, could find comparative comfort. This "powder" (if we may call that powder which comes in sticks as big as a lead-pencil, or grains as large as a walnut) must have high explosive force, but not be explodable by shock. It must stand moisture reasonably well, neither change with time, injure the bore of the gun, nor dirty it very much; and in exploding must generate no poisonous gases. It must burn comparatively slowly, in order not to put too much strain on the breech of the gun, before the shot is in motion, but must be fully exploded and changed to gas by the time the missile has reached the muzzle of the piece; otherwise there would be not only a loss of powder, but also unpleasantness for those in the neighborhood — especially on board ship.

This "powder" must be made of materials that are to be had not only somewhere in the country for which the explosive is intended, but right in the neighborhood of the manufactory; and such materials must be capable of being rapidly converted into the explosive. It would be an advantage if the powder had a high specific gravity, in order to reduce freight charges and facilitate its transportation by the army.

There is very much room for improvement in cements for porcelain and glass, especially for such as the lamp-manufacturers use to fasten glass and metal together, as for instance where the glass bowl of a hand-lamp is cemented into the metal cup at the top of the pillar or stand.

Find a substitute for glass as a material for telescopic and microscopic lenses, having as great a refractive power as the diamond — and name your own price for it.

Oxygen-making and hydrogen-making are not yet easy enough or cheap enough on a large scale.

The number of possible new alkaloids would possibly bankrupt one's arithmetic to compute. It is probably feasible to produce them to order, having any desired effect upon the human system.

In the manufacture of paper, such matters as strengthening and toughening thin sheets without making them stiff and brittle have yet to be looked into. A soft, flexible parchment paper is needed.

In paper-making there is needed a chemical pro-

cess for making wood pulp, which will destroy the fibre less than the present.

There is room for a domestic bleaching powder or fluid which shall not corrode the ordinary textile fabrics.

To supply some solution which will have the general effect of creosote in preserving wood from rot, but shall not be dissolvable out of the wood, if the latter is immersed in water, is a great thing for which to try.

A better material for decorated picture-frames is highly desirable; that now used is too brittle and soft.

Up to date there seems to be but one glaze for coffee-beans to prevent their losing their aroma after being roasted. That glaze is sugar, of which the patentee or special exploiter of the process says that he uses about three per cent. It forms on the berry a coating of caramel. This has its disadvantages: it is not proof against moisture, and persons afflicted with Bright's disease should not take even so small a quantity of sugar into the system. Even if it would do them no harm, they would fear that it would, and so not buy the glazed coffee. *Verbum sap.*

Sculptors and manufacturers of picture-frames would like a better material than the glue-and-molasses, or glue-and-glycerin, mixture which they now use to make undercut casts of plaster of Paris and compositions thereof. The mass now used gets

moldy soon, and is affected by heat and moisture, so that if the molds are not used soon after making they are useless.

Patent-leather manufacturers seem to be without any material by which their wares can be given a new bright surface when the old finish is destroyed by moisture or by friction. There are plenty of "creams" that are merely smears, which give a sort of a polish; but they either build up a gradually increasing layer of new varnish, or make a greasy coating that the least rubbing destroys. Perhaps it would be possible to renew the surface by a partial dissolving of the outer layer, thus running the material together, as is done in the restoration of old oil-paintings the varnish of which has become badly cracked.

There are few processes — perhaps only one — by which glove kid can be cleaned and left soft and flexible without removing the outer layer and consequently "scuffing" away the color. The same holds good of fine morocco, such as is used for ladies' shoes. These will not bear washing when they get very muddy; and dry cleaning does not suffice.

For household utensils there is needed a better white enamel than is at present on the market. The prime requisites are that it shall be resistant to acids and alkalies such as are to be found in the average household, and stand light blows without chipping. For those utensils which are used for cooking purposes, the enamel must not only be quite resistant

to heat, but to a certain extent able to expand and contract with the varying temperature of the sheet metal on which it is baked or burned. And further, it must be free from lead or other poisonous ingredient.

Chapter III.

METALLURGICAL

Every now and then somebody claims (or some one else claims for him) that he has discovered a process by which to isolate aluminium at very little cost. Some good starts have been made in this direction, but we are only in the a-b-ab's of this metallurgical industry. There may be a dozen processes, each of which would pay well and all of which would be as satisfactory as the ones now being worked.

Now that aluminium is so cheap there is a demand for better solders for it than are known at present, even to experts.

Metallurgists want a cheap processs for extracting silver from very low-grade ores in paying quantities.

Hardening copper is an art which, it is said, was once possessed by the ancient Egyptians. If they had it they lost it completely; and when they lost it they lost a very valuable art. The re-inventor of the old process, or the discoverer of a new one, should become famous and rich.

If you could only extract the gold from ordinary brick clay, in somewhat the same manner as the aluminium is now taken out of it, you might think Crœsus a poor man compared with you. There is enough gold in an ordinary Philadelphia brick to make a piece of gold-leaf two inches square.

A good way of recovering the tin from scrap-tinned iron should pay.

The whole art of making castings under pressure needs to be learned. It is but in its infancy. There is required a casting-machine which will do in steel, iron, and brass what the type-casting machine does in type metal.

Direct processes for making iron and steel from the ores should engage the attention of practical metallurgists. There would be but little use for an outsider to work on this line; there are too many things about it which must be learned by long-time observation and experience.

There is only about one firm in America that can make what is known as Russia iron; and the recipe for doing it is not posted upon its outer walls.

In steel-making there are ever so many possible compounds of iron with other elements, which would have value for special purposes if they were experimented with. Other steels than carbon, silicon, and chromium compounds should be worked out and experimented with.

[Since this hint was given, in 1892, the entire machine-building industry has been revolutionized by the new steels then pointed out, and which appeared in 1900. The new vanadium, tungsten (or wolfram), and molybdenum tool steels cut five times as fast as the old-fashioned carbon steels, and do their best work at high temperatures which would

ruin their predecessors. There is, however, room for more experiments and more progress.]

In the matter of hardening these new steels, the consumer is at a disadvantage, for no two of them call for the same treatment, and many of their manufacturers prefer to harden all tools made from them, themselves. Special hardening appliances therefor are commencing to appear; some of them employ electricity to heat the material; and some, compressed air to cool it.

Up to date there is a shortage in the number of useful additions to iron; namely, one which will make pig iron at once malleable. At present there is no intermediate doughy state which precedes the melted condition. If there were a material which could be added at the time of melting to produce this intermediate pasty condition, and thus permit pressing or forging the doughy metal in molds, it would be a most welcome addition to the materials used in siderial metallurgy.

Regenerative gas stoves made a complete change in the iron and steel industry, but are as yet far from perfect. The author finds the masonry too dear. If nothing else can be done to cheapen their construction, then it might do to invent a process by which large blocks of fire-brick material could be manufactured, preferably with perforations therein which would enable them to be built in so that each could take the place of several smaller bricks with interstitial passages.

Chapter IV.

MINING*

There is needed a Davy lamp which is of simple construction, cannot be opened by the miner or by any appliance that is to be found except in the lamp-station outside of the mine, but the flame of which can be adjusted or extinguished by the miner.

No one has succeeded in producing a machine or process which will separate graphite from the mica and quartz with which that mineral is so often associated. These have the same specific gravity as graphite, and, like it, are unaffected by acids, alkalies, or high temperatures; and the most valuable form of graphite is flaky, which makes a still stronger point of resemblance between it and mica. Rock-drills operated by compressed air are subject to a particularly annoying peculiarity: the expansion of the exhausted air causes the formation of snow at the exhaust outlet, and the combination of this with the oil used in the cylinder is very apt to clog the exhaust and interfere with the working of the machine.

A prize is offered for a strong and reliable safety appliance to hold a mine-car in case the rope breaks.

*See also the chapter " Inventions for which Prizes Are Offered."

The damage caused by a wagon which gathers speed as it runs down the slope is often very great — and of course we must take account of the danger to human life and limb.

Some one should get up a machine for sorting the slate out of coal — a "dry" process preferred.

A good coal-cutting machine would bring buyers from all over this country, to say nothing of the world at large. Coal is too dear. It should be got out of the mines more cheaply, so that from one end of our broad land to the other no poor person need either freeze or shiver.

If some one would go out in the oil region with a good "grapple" for well-boring tools, he would have a mob of purchasers about him in short order.

Chapter V.

RAILWAYS AND TRAMWAYS*

There is a chance for practical inventors to change the whole idea of railway-train braking. The brake should be applied to the rail, and not to the wheels of the train. Brakes applied to the wheels simply permit the train to skid, and cause flat places on the wheels. Brakes applied to the rails would ease the momentum of the train in friction between it and something not within itself.

[When the author first advanced this idea, about 1872, he was very liberally derided by those who "knew better." He took comfort in the endorsement of America's foremost civil engineer, the late John C. Trautwine, of early Panama Railway renown, and bided his time. In 1892 he again gave vent to his opinion on the subject, in the first edition of this work. Since then, one of the most prominent manufactories in the world has adopted it for electric railways.]

There is need of a device by which a train can be stopped at any point in its run from any station

*See also the chapter "Inventions for which Prizes Are Offered."

of a line. This is needed not only in the case of "wild" engines which have escaped control, but for trains which have gone past a signal, or have not heeded it, or are not within signaling-range.

[This call for a device by which trains could be stopped in an emergency, without the concurrence of the trainmen, was almost at once answered by a Hollander, who, however, entrusted his patent application to a "bureau" run by a man who had not the requisite familiarity with his own business to make the application in proper form and time, so in this instance his work was unfortunately "love's labor lost."]

The problem of car-heating is not yet as well solved as it needs to be and as it will be some time in the future, when the deadly car-stove is definitely abolished from off the face of the entire earth. One reason for the obstinate retention of the car-stove is that the "powers that be" are waiting for the best thing which can be produced to supplant it. The field is still open for intelligent competition of brains.

A station-indicator which will show what will be the next stopping-place, and will skip those at which the train does not stop, is loudly called for by the traveling public; and railroad officials and employees would be prejudiced in its favor.

Did any one — expert or non-expert — ever see a perfect rail-joint for steam roads or electric tram-

ways? When we reflect that the joint is the weakest part of the road, and that by reason of its weakness the entire road is just as weak as that weakest part, the importance of the matter will appear.

As our timber supply is getting less and less, there is more and more need for a good iron or steel railway tie.

There is still room for another snow-plow — one which will cut its way bodily through deep snow, and throw the material removed out of the way, where it will not cover the adjoining track. It must be able to throw the material from the right-hand track clear over the left-hand one, and *vice versa*, and deposit it so that it will not come down again.

Locomotives that do not burn coke or oil are apt to throw sparks, and the spark-catcher has been a frequent subject for patents. But whether a deflector or a screen, it has not shown itself to be perfect, and the railway companies still pay large sums for burned property, and probably evade the payment of still larger amounts. The nuisance to passengers is, of course, unfortunately only a side issue. The companies would not mind being able incidentally to prevent the discomfort to passengers; but this burning of crops along the route, and setting fire to cotton on gondola cars, must be stopped, if any inventor can be found who can stop it. Of course, the proposed spark-arrester must not make back pressure on the engine, nor reduce the draft through the grate.

It would be very convenient if the train hands could light and extinguish the car lights from the car platform, instead of having to run along the roof to do it.

Hot-box signals have not yet been generally introduced, because those which have been offered have not been satisfactory. There was one which consisted of a piece of red paper that turned brown if the box to which it was affixed ran hot; but what would be better would be one to give the engine-runner, or the engineer, or the conductor, as the case might be, an audible signal at his post. Until this is invented we might make use of the visual signal for all journals or boxes which are not within hand reach. For fast through trains the colored-spot device has of course no use; in such cases there must be a bell rung in some part of the train where the proper employee can hear it. The device must be sold cheaply, and not be affected by bad weather nor by changes of temperature.

It is remarkable that so many engineers and others who have the inventive talent, and also the inventive habit, have seen, so many thousands of times, the driver or the conductor of a tram car get out and throw a switch-point. This should be done from the car platform. There is one method by which the horse of a one-horse car can be made to step on one side or another of a plate lying between the rails, so as to throw the switch to right or to left; but nowadays one-horse cars are getting scarce, and

there should be a device by which the switch can be thrown while the car is moving, and from such a distance that no matter how great its speed, the switch shall be open or shut, or thrown right or left, as desired, when the car gets to it.

The terrible accidents of 1900 and 1901 in Germany, which resulted in the passengers of a derailed train being roasted alive by the gas escaping from the reservoirs of a wrecked car, should have been incentive enough to inventors to have resulted in the production of a safety system by which a repetition of this horror could not take place; but as yet gas-lighted cars are in the same dangerous position. Putting the reservoir on the car roof does not help matters, as cars are so often overturned in derailing.

The author will not pretend that the theoretical car-coupler has been invented, still less brought into universal use. But it is a fact that the demand for a good coupler to take the place of the many imperfect ones formerly in use brought out so many hundreds of models, and caused the lives of the railway officials to be such a burden, that at present the prospect of a new coupling being adopted or even tested is too slight for it to be worth the while of any inventor to put time and money in working up this line.

The length of the wire, rope, or chain used to throw switches or signals at a distance is so apt to be affected by changes of weather, or increased by stretching in use, that it is better to perform such

operations electrically. There are in use two quite good systems for doing this, but they are not so nearly perfect as to prevent inventors producing something entirely different and just as good for less money, or simplifying and improving those now in use.

There is still the want — let the author say the positive necessity — of a device by which the engine-runner may receive in his cab an audible signal if there is another train, or part of a train, within a specified distance of his own, no matter whether before or behind him, nor in which direction it is running, if at all.

A platform weighing-machine which will record the weight of each car of train passed over it ought to pay.

Car-starters for street-railway lines have not been given enough attention. There must be something which will store up enough power when the car is in motion to start it easily when fully loaded, after it has been brought to rest. If it can be still further developed so as to store up while on down grades a certain amount of power, and give it out again on the up grades in aid of the horses, there will be money in it.

The cable-railway men have not yet found a perfect grip. The ones that they have are defective, and they know it. *Verbum sap.*

Chapter VI.

MARINE*

The perfect hull model is not yet.

Some one should invent a fire-proof and undecayable wood with which to cover the iron and steel work on board ship.

There is still room for the invention of a cheap cellulose-like material for filling the space between the hulls in a double-hulled vessel, so that if a shot or any other cause make a hole or a rent, this material will at once swell with the water and prevent the filling of the compartment back of the injury. This result has been attained to some extent with cocoanut fibers, Indian corn pith, etc.; but the demand is not yet covered by the supply. The material must be light, very absorptive of water, highly compressible, and if possible fire-proof and non-decayable.

The perfect screw propeller is not yet in metal, and, probably, is not yet on paper. Here is a wonderful chance for those who are "up" in the mysteries of propulsion to produce something which will benefit mankind and also make the inventor rich, if he handles his invention properly.

Hydraulic ballast for large ocean steamers is not

*See also the chapter "Inventions for which Prizes Are Offered."

yet as perfectly applied as is desirable. Here is your chance.

Can you make a better feathering paddle-wheel than those which are in use? If so, do not hide your light under a bushel.

Jet propulsion of vessels is being tried, but there is plenty of room at the top in this line, and there is cash at the top for those who get there.

Something better than the present naphtha launches would be snapped up greedily by those who love the water and have no knowledge of engine-running.

The great storm at Samoa should have convinced any one that there is need of a better anchor than those which failed to hold the ill-fated vessels in that notable harbor.

There is also need of a better boat-disengaging hook than is used in our (or any other) navy.

The life-boat offers an excellent opportunity for invention in a line which should be at once profitable and humanitarian. There is no boat which will stand a heavy sea without capsizing or being stove in.

Any one who looks at the cumbersome methods employed in dredging out our harbors (and even they are far in advance of those used in other countries) will admit on sight that there is need of better.

The correct way to make a screw propeller is by some other method than those which have been tried up to date.

That a gyroscope can prevent the rolling of a ship is well known; as yet, however, the principle has not been practically developed; and here is an opportunity for some inventor who understands not only the principle of the gyroscope, but something of practical ship and marine engine building, to work out an application of the gyroscope to ocean steamers, especially those for passenger traffic.

[Since writing this, considerable progress in this connection has been made.]

Strange as it may seem, all attempts to replace wooden masts and yards with hollow ones of iron or steel have proved unsatisfactory. Like the steel wire-rope rigging, they seem to lack the requisite elasticity. Be that as it may, there is a field open; some day the reason for the failure will be discovered, and when that is done the invention of the remedy need not follow at any great distance. The solution may he found in a manner of making seamless steel tubes of the required length, with walls of thickness gradually diminishing towards the tip.

Iron ship builders do not seem to be thoroughly satisfied with the riveting-machines which they have, whether they be driven by compressed air, by steam, or by water. They are as a rule too unhandy.

It would be very desirable to replace the hemp ropes (as a landsman would call them, although from the nautical standpoint there is but one "rope"

on board, the "rope's end") by wire; but the difficulty lies in the lack of elasticity of the latter. Where any great strain comes on the masts and shrouds, if these latter are of wire rope and do not break under the strain, they are apt to rip something loose. Cables and sheets (the word here used in the sailor's sense) which would be as strong as steel and as elastic as hemp would be "a consummation devoutly to be wished."

There is need of a varnish or similar compound for the hulls of iron vessels, and still more so for those of steel, which would be smooth and resistant to wear, and prevent, or at least not encourage, the formation of barnacles and other growths which so seriously impede the progress of the vessel. The material must if possible be a quick drier, as docking-charges are high, and war-vessels cannot always spare the time to be laid out of commission a long while to be scraped and painted. It was said long ago that the Japanese, from whom we have to learn so many things, had such a compound, the only objection being the long time required to dry. Then, however, time was less of an object to the Japanese than now.

By reason of the increasing weight of ships' hulls, there is an increasing necessity for improved launching-ways.

Chapter VII.

MILITARY

Smokeless powder now used for cannon has among other bad qualities that it leaves the bore of the gun covered with a muddy deposit which mars the accuracy of the aim and increases the difficulty of cleaning — thereby, of course, lessening the speed of loading and firing. Therefore, in working along this line, perfect combustion of all the ingredients is to be aimed at. The nearer it is attained, if not at the sacrifice of some other good quality, the better. (See also the chapter "Chemical.")

Safety-devices for rifles and revolvers, which prevent firing unless the finger is on the trigger and the cock or bolt raised or withdrawn, are greatly to be desired. There is such a device, and a very good one, but it is controlled by a single firm, so that a competing device, if just as good, at the same price, would go well.

To design a limber for field artillery which would weigh about one third less than the present ones, so as to make up for the increase in weight of the cannon, due to the recoil devices and the steel shield now usual, is a problem which should be attacked only by those familiar with the demands of the service.

Those who take an interest in matters warlike will find in the breech-loading cannon opportunity for them to try their mettle and their metal, too.

The task of producing a recoil device for field artillery, which would be reliable under all circumstances, and be more simple, yet stronger, than those now in use, has been confided to several experts; but their knowledge of what is needed seems to be greater than their ability to produce the desired arrangement and construction.

Some one will come along and throw dynamite shells out of an ordinary cannon with a high explosive to propel it; and then he will most likely be both famous and rich.

The air-gun as a weapon in regular warfare has not yet been given the attention which the possibilities of the case would seem to call for. Being smokeless and practically silent, it should be a very useful weapon. Zalinsky has shown us long ago what it can do in the way of throwing dynamite.

For camp purposes the officers should have a good portable folding writing-table, which when opened out for service should be absolutely rigid, and stout enough to bear considerable weight. It goes without saying that such a table should weigh but little, and be so simple as to be easily and quickly put together by an ordinary servant, or by an orderly.

The folding beds which are delivered for army use might very well be better, from the point of view

of stiffness, strength, and preservation of their original lines. Further, some of them, once bent in transportation, are hardly to be opened out, much less set up. If a bridge-builder were to combine with a sailor in designing such a bed, it would be apt to fill the bill, if the cost of production could be kept down.

The requisites of a good army tent are that it shall be light, compact, rain-tight and wind-tight, easily put up and taken down, not readily upset by a stray mule getting in the ropes, and durable under extremes of cold and heat; that is, it must not get stiff and hard in cold weather, nor stick in warm. And any common soldier must be able to put it up, take it down, and fold it up, almost in the dark. If possible, it should be fire-proof; and most assuredly it should be proof against mildew if folded up wet, as it is sure to be.

Navigable balloons and aëroplanes for military and other purposes are not beyond the reach of human capabilities. Some very successful attempts have been made by Santos-Dumont, the Renaults, the Wright brothers, and others. There are details which need to be worked at. Whoever gets them down to a practical shape need have but little difficulty in sailing the air, and in going where he pleases.

Chapter VIII.

MACHINE CONSTRUCTION*

In the matter of ball bearings, cone bearings, and roller bearings there is field enough for a dozen more inventors than those who are already making money in this line. There is still room for anti-friction bearings that can be manufactured by the hundred or the thousand, according to their size and character, and used by machine-manufacturers just as they would use any other standard supply, as lubricators or keys — simply put in place. If such bearings were made on a scale large enough, and backed by a company with capital, ability, and experience, machine-builders would redesign their drawings most willingly, so that they could just slide into place the style of bearing best suited to the pressure and speed, or which might be so considered by customers.

Apropos of ball and roller bearings, I should say that provision should be made therein for possible expansion in length of the shaft by heat; because even with anti-friction bearings accidents do happen, and expansion does take place.

Screw machines intended for the average shop,

*See also the chapter "Inventions for which Prizes Are Offered."

and not for the manufacturer of screws alone, would go well if it were not necessary to adjust too many cams or stops every time the pitch or the length was to be changed.

The perfect machine for grinding railway-car wheels and locomotive wheels does not stand in any shop in either Europe or America. There are good ones, but too few of them have cut loose from old and preconceived ideas. Newton of Philadelphia was one of the few machine-tool builders who had more confidence in the judgment of the customer, as to what was needed, than in his own on the subject in question. His development of the cold metal saw for railway-shops is a good example of the value of finding out, before commencing to design a machine, what the users of such machines found to be faults in these latter, and what would be desirable in a new type. The wheel-grinding machine should work the wheels true to diameter and profile, and correct its own faults, as is the case in the calender-roll grinding-machine invented by the late J. Morton Poole. The machine should grind both wheels at once, and alike, no matter how much more one was flatted or otherwise worn than the other. It would also be advantageous to grind the journals at the same time — and would it be going too far to ask that the appliance for grinding the pins of locomotive-drivers should take up the work after the journals and tires were true, and do the pins also, without changing the setting of the

wheels? Such a machine calls, naturally, for two kinds of centering: on the conical centers, to permit grinding the journals true, and then doing the tires while the pair turned on its own journals. The crank-pins should be turned while the set is mounted on the journals.

No cheap process for making twist-drills with oil-grooves is as yet at the disposal of manufacturers of such drills. The improvements in steel call for better drills; but there are limits to the prices which will be paid for drills with oil-grooves.

Inventors are very fertile-minded, but the need of a good flux for brazing cast iron remains unnoticed or unconquered.

Of the making of die-stocks for screw cutting or threading there is no end; but there is yet room.

The increasing use of water under pressure in machine-shops should encourage inventors to produce hydraulic cranes and jacks — the latter not merely for lifting weights, but for pressing in and out bushings, plugs, shafts, mandrels, etc. Bollinckx of Brussels presses in plugs where he finds a fault in a cylinder casting; the work is cheaper and better than threading both the hole and the plug, and screwing the latter into the former. This is only one instance of dozens about a shop where hydraulic pressing could be used to advantage.

The micrometers which are in the market have too little range; it would be well to get up some which, while they would have the fine adjustability of the

present ones, would be able to take in a greater range of lengths or diameters.

The use of "boart" or black diamonds for truing off emery-wheels is much handicapped by the difficulty of getting them firmly set in metal. Galvanoplasty has done much to help out in this respect, but this requires a special electro-depositing plant and a skilled man to run it. A good all-metal setting, requiring no electric appliances, would be well received.

A prize has been offered for a device which would prevent the running-down of the drum of a crane or derrick when the load was on; as accidents often happen not only by reason of the falling load, but by the rapidly rotating crank. The ratchet-and-pawl device is insufficient.

Chapter IX.

MACHINE TOOLS

The advent of the new fast-cutting steels has rendered or will render necessary the remodeling of almost every machine-tool now in use, and the design of many more. It is not merely that the machine-tools built before 1900 have not the speed and the stiffness to be used successfully with tools of the new steels; the entire field of machine-tool design and of metal-working must be gone over again. The "hog cuts" that the new steels can take in roughing will lessen the necessity of such exact forging as has been necessary to avoid turning off much metal; and the failure of the same tools to finish as well as their predecessors will make machinists have recourse to the emery-wheel and its congeners twice as often as before.

Outside of this, new problems are presented and old ones posed more often than before.

The lathe, for example, is called upon, even in non-metric countries, to cut metric threads; and still the old denominations must be kept. There must then be lathes which without taking them to pieces and putting in other lead screws can change from inch to centimeter pitches by the throw of a lever, just as the present ones of late design can vary the pitch by sliding a button in a groove.

There is also call for increased facility for grinding on the lathe pieces already roughed thereon; chucking being inadvisable, as giving rise to inaccuracy, and being expensive. It may be better to finish by grinding on the same lathe that does the roughing.

Then lathes with drive from both ends are getting into favor, to enable a thread to be cut on both ends of a piece that is plain cylindrical in the middle, or to turn off a very long piece without having to turn it end for end.

Better taper-turning facilities are also called for.

The compound rest is very convenient, and we all wonder how our grandfathers did without it. Our grandchildren will, however, wonder how we ever dispensed with attachments for turning and boring spherically.

The planer has been improved by side heads and milling-attachments; but arrangements for convex and concave planing belong to the planer, and should be furnished therewith.

The planer of the future should have, to supplement increased speed and strength for the use of the new rapid steels, a grinding-attachment by which the roughed-out pieces can be finished without rechucking.

Of the radial drill of the near future the buyer will demand that it shall be able to drill two parallel holes that lie in the same vertical plane as the arm. At present, as soon as the machine gets a lit-

tle old, and if the holes to be bored are up to the full capacity of the machine, the one bored with the drill at the end of the arm will be apt to be inclined from the vertical, because the arm tips up. (Here it is the holes that are radial with respect to each other!)

The ordinary drill-press (so called because it is not a press) should be given an attachment by which it could bore radial holes in a cylindrical work-piece at any desired angle from one another all around the whole circumference. Such work comes up often, as for instance on the cores of slab milling-cutters with inserted teeth.

Chapter X.

RECORDING AND VENDING APPARATUS, Etc.

The cash register in its many forms is a wonderful piece of mechanism; but it does not test and throw out false coins, as does the apparatus for selling postage-stamps, etc.

While there are cash registers for almost every possible set of conditions likely to be found in large establishments, small shops have received little attention from cash-register inventors; and there are more small shops than large ones. A small shop with one or two salesmen can seldom afford to buy an expensive register.

One can buy from automatic vending-apparatus post-cards, cigars, and packages containing a very small amount of chocolate done up in a prodigious amount of pasteboard; but when it comes to devices for selling a quart of milk, a pint of beer, or a gallon of petroleum, the machines are not on view. Such a machine need be but a development of those used in restaurants for delivering coffee, or liqueur, in measured quantities.

Cheap letter-scales, which instead of giving the exact weight (which interests no one but the employees of the registered-letter department) would give

only the number of "rates,"— that is, would indicate the next highest step in the scale of payment — would sell like hot cakes. There are such scales, and they are very well made; but they are too expensive. Our post-offices use some of them; European offices do not; and this latter trade alone would make a good income for the manufacturer.

A further, although more difficult, step would be towards the production of an automatic letter-registering apparatus, so that one could drop a letter into one slot, and the necessary fee into another, and get a numbered and dated receipt corresponding to the number and date imprinted by the apparatus at the same time on the letter. At first, it would be necessary only to take in letters of the ordinary minimum weight charged for. Perhaps a later refinement called for would be to record the weight on the letter and the receipt; and if the letter were of a greater weight than that paid for, to return both the letter and the money. More difficult tasks are performed every day by automatic apparatus.

There are plenty of devices for registering the time of coming and leaving of employees in establishments having large numbers of workmen, etc.; but such devices are as a rule too complicated and expensive; and some of them, while mechanically nearly perfect, are based on a system which permits error and fraud. The apparatus must be infallible, and shut out fraud and suspicion on the part of either the employer or the employee.

Numerous experiments have been made with automatic machines for the sale of daily newspapers. The difficulty has been that the average daily paper seldom has a fixed number of pages, and it is not in the nature of things that publishers would refuse a few hundred columns of advertisements for the Sunday edition just in order to keep it to the same size and weight as the Monday issue.

One of the chief nuisances in drug-stores is the constant call for the directory. Just when the attendant is busy with a customer, or perhaps putting up a prescription, he must either stop and get out the directory or offend the caller. If the book is left at the disposal of every one it soon gets destroyed. If there were automatic machines which on a certain coin being dropped into a slot therein would release the directory, druggists would very gladly put them in, because they would be a source of income.

Nearly all the calculating-machines which are at present on the market fail to meet the popular demands. As a rule they are expensive, heavy, complicated, and easily put out of order — or else they are mere playthings that could not be used in any office for making regular business calculations all day long, week in and week out. As a general thing, also, they are merely adding-machines, that perform multiplication and division by an extended series of additions or subtractions. In order to prevent false reading of the results, it would be desirable

to have these latter printed by the machine on a strip of paper. And it would be better yet also to have printed all the items which go to make up the result, so that errors in reading from the originals could be detected by comparison therewith.

Chapter XI.

MISCELLANEOUS MACHINES

Shortly after the writer called for a machine which would make ships' chains in continuous lengths, one was produced which seems to fill the bill most perfectly as far as it goes; but the links thus made have no cross-strut, which is very desirable to prevent the chain from kinking. The strut adds but little if anything to the tensile strength of a properly made chain, but kinking must be prevented, especially on anchor-chains and those used for general hoisting.

Some time ago the writer was called on to build a machine which would bundle slats and narrow slabs of wood about four feet long, of various widths and thicknesses, and usually tapering in both width and thickness. The object was to make bundles which could be fired in a steamboat boiler as though they were logs of wood. The device which he made was crude and cheap, being built out of what material there was at hand in a small logging-town. There is room for some one to take up the matter and carry it out to perfection, thus providing sawmills with a market for their slabs.

A machine for bundling ordinary kindling-wood would pay still better.

A better box-nailing machine than is now on the market would be a good thing to get up, particularly if it could work on boxes of all sizes without much or any special adjustment.

Brush-manufacturers call for a light and durable machine for boring the backs of several brushes at a time. If another machine were to be had, by which the holes of the larger brush-backs could be filled with the bristles, it would be welcomed gladly.

Of wood-working machinery there is endless variety; but stone-working machines are scarce, and usually, to quote our Gallic cousins, "of a simplicity." It is not to be expected that the same machine would satisfactorily work sandstone, marble, and granite; but it is not too much to hope to be able to get a machine to dress granite at a reasonable speed without plucking out flakes from its surface, or stunning it so that it would not take a polish if rubbed for a week. After the machine for working plane surfaces is delivered, and proved worth buying, users will call for one for working out simple moldings. It goes without saying that the tool used on the machine must be of a material, character, and manner of application that will not render sharpening necessary every ten minutes, even when the machine is working at top speed.

Bones are difficult to crush, and still more difficult to grind. Nearly all the bone-mills on the market are too lightly built, and require too much power to drive them, by reason of their not handling the

material in the right way. Every material requires a special kind of blow or friction to disintegrate it advantageously.

Besides the need of a machine by which to free bones from the adhering meat, there is the want of one to clean the intestines used in sausage-casings. To do this by machinery has heretofore been considered almost impossible, as the machine that removes all unnecessary membrane from the skin is apt to shave this too thin in places, or to cut it through. Either of these occurrences is fatal to the worth of the intestine as sausage-casing.

If one visits the great sausage factories of Braunschweig or Wolfenbüttel one will see meat-chopping machines that hack with a rocking motion; but every machine is tended by a man or a boy, who carefully turns the material after each passage of the rocking knife. Machines which do their own turning do not seem to have appeared at the headquarters of the German sausage industry.

Basket-weaving remains an art which is but little beyond where it was in the days of the Pharaohs. Even a blind man, properly instructed, turns out the same class of work as he who is blessed with sight. The basket-weaving machine is not yet visible. Your fault?

The machines now in use for perforating postage-stamp sheets are too dear, and the machine, dies, and perforated plates wear out too fast. There would not be many sold, but a better class of machine would sell promptly and bring a good price.

The manufacture of wax matches or "vestas" has not kept pace with that of the ordinary wooden ones. There is a call for machines which shall make them by the mile and cut them off, besides putting on the heads and laying them out to dry; all, of course, without causing friction which would start fire in the line. [The word "wax" here includes all the cheap compositions of paraffin, spermaceti, ozokerite, etc., which are at present used for candles and tapers.]

Manufacturers of envelopes inform the author that the machines in general use for folding, gumming, and drying envelopes are not suited for making certain shapes with extra long tongues. The manufacture of these by hand is too expensive and takes too much time to enable them to be put upon the market at any but prohibitive prices. The author knows of a case where the inventor of a patented envelope was prevented by the above-named difficulty from developing his patent.

There is needed a cheap method of manufacturing pasteboard tubes for mailing drawings, engravings, etc. The tubes should preferably have one end permanently closed and the other fitted with a cap, easy to be removed but difficult to lose.

There is no device for filling and closing coin-rolls. One for each size would be good; an adjustable one, which would pack any size for which it was adjusted, would be better. Banks and post-offices, as well as department-stores, would buy them.

Chapter XII.

FOUNDRY PRACTICE

Foundries suffer from the lack of a good process of cleaning castings without the use of acids which weaken them. The sand-blast does excellent work on many kinds of pieces, but on some it is too severe, and on others involves too much labor.

Small foundries could use to advantage a small molding-machine; and as there are more small foundries than large ones, this want should not go unheeded.

The sand mold is better understood nowadays than formerly, for the reason that founders are commencing to distinguish between sand and sand, and by means of blends of various sorts, as well as by the addition of various compounds of glue, water-glass, etc., they are getting molds to suit the different kinds of patterns, cores, and iron. But there is much small work where an artificial material would do better than any natural sand or any blend of various sorts thereof. The desired material must be resistant enough to withstand the pressure of a good head of melted iron, and the expansion at the moment of solidification; must at the same time be porous enough to permit the passage of the gases generated in pouring, especially where there are no

cores to help vent; and must either give smooth surfaces without the necessity of facing, or at least permit of facing without danger of breaking down on the sharp edges.

Bronze-founders call for a molding-material which will not form a crust on the castings made therein.

We know too little about casting under pressure, except that where there is a good head there is a better chance of sharp castings than where there is but little. As to artificially creating a high pressure, so as to drive sluggish metal into the fine lines of the mold, and to drive out as much as possible of the gas which would otherwise form pores and even blow-holes, there has been too little done and too little tried.

There should be a method by which castings could be made as sharp with iron, steel, and copper as are now attained in type-casting.

In attempting to cast silver one encounters difficulties almost without end. Some day the secret will be discovered, just as it has been with copper by a select few, who are very careful to keep it to themselves.

There are few of us who have seen good copper castings; fewer yet who have made them. When one looks at the complicated pieces which are used in the commutators of dynamo generators and motors, and which, when they are not drop-forged,—which only pays where there is a very large quan-

tity to make,— must be laboriously sawed and filed out from the plate, one must admit that copper casting would come into play here. And there are hundreds of other possible applications. The best copper casting would be one which would be as dense, and as conductive to electricity, as the electrolytic; would in this instance weigh about 20 per cent more from the same pattern than what we usually get, have a salmon pink instead of the usual deep red color, and a fine crystalline fracture like that of statuary bronze. It would also have a much greater degree of toughness than ordinary porous castings.

The ancients — that is, the 'way-back ancients — are said to have been able to harden copper. The author neither admits nor denies this. It is possible. The art would be very well worth rediscovering.

Chapter XIII.

HEATING

An oil-stove which will permit of broiling, can be used in the open air or where there are heavy draughts, and which may be kept burning ten hours at a time should find hundreds of thousands of purchasers.

There is need for the invention and manufacture of an appliance to be put in an ordinary stove or kitchen range, by which, without an offensive smell, petroleum may be burned right in the grate used at other times for coal.

The superheated steam oven is an invention which should pay to develop into practical form for everyday use by ordinary baking-establishments. The idea of baking by steam has been tried and found very successful in large institutions and on ocean-liners. Who will give the baker around the corner, at a reasonable price, an oven which will run by steam only and give better satisfaction than the present coal-heated or wood-heated affairs?

The use of fuel brikets (what is the use of spelling this word with a *q* and two *t*'s?) is on the increase in industrial establishments, and for locomotives and steamers; and for the household the new fuel is making steady, if rather slow, progress. One obstacle is that housekeepers are too well satisfied

with their self-feeding stoves for small coal to be willing to use a fuel that has to be fed in from time to time. The moral is that an arrangement by which brikets of two pounds' weight could be fed continuously all day long into a small stove would be desirable.

The manufacturers of brikets of anthracite culm — and more particularly those who are not yet such manufacturers, but would like to be — seek a binding-material which shall be as effective as pitch, but would not smoke nor make the stokers' eyes sore, and which would also be cheaper. Clay has its advantages from the point of view of the manufacturer, as it weighs heavily but costs next to nothing; but housekeepers find out after an extended use, and power-users right away, that there is too much ash where it is used as a bond, and that it does not pay to give the same price per ton for clay as for combustible. Rye flour has been proposed, and even used, but it is not safe to presume that its employment would be possible on any very extended scale, under all harvest conditions.

There are all sorts of meters — their reputation is not of the very best. Only steam-meters are not proverbially liars, because they are too few to have become proverbial. Those that are in existence have but limited use, are too complicated and expensive, and sometimes require a mathematical education to enable one to know what the measurement is.

Chapter XIV.

LIGHTING

Those of us — and who is there that has not? — who have grumbled at the size of the monthly gas bills would be glad if they could make gas at low cost without increasing the rate of fire insurance on the premises, and without finding the quality of the gas (or so-called gas) delivered to vary with the temperature of the outside air. The household gas-machine that will do this is not yet in existence; if it is, it is manufactured in strict confidence in some spot to mortals unknown.

If you cannot get up the desired gas-machine,— so called because it delivers a carburetted vapor, which is no gas at all and stratifies when the temperature falls to zero or even sooner,— then invent a gas-meter that will not be as inaccurate as those known to all of us, and which for all that are so readily tampered with by dishonest consumers. The test of the accuracy of such meters is that the sum of the readings of all the meters in a line should very nearly equal, but should never exceed, the reading of the station meter. But there are cases where the total of the readings of the customers' meters has been greater by twenty per cent than the reading of the station meter through which passed all the gas which the customers received.

There have also been cases where no leaks were found, and the drip-pots were clean, but for all that the customers' meters would not account for more than three fourths of the gas delivered. Is it any wonder that the gas-meter rivals the telegraph in its reputation for untruth?

In any tall building the gas-pressure in the upper stories is apt to be greater than in the lower; and those who live next or near to a church or theatre usually notice their gaslights flare more or less when many lights in the neighborhood are extinguished. This is no more than should be expected from a fluid like gas, lighter than air and flowing through pipes, under pressure from a weighted reservoir. The problem is how to stop the flaring, and how to give each burner its share of gas under that pressure which will produce good combustion at an economical rate. Having a pressure-regulator to keep the supply to the house equal at all times prevents the variation of pressure when the lights in the neighborhood are extinguished; but in tall buildings there remains the difficulty of the upper stories getting the most pressure. A pressure-regulator for each story is in this particular a great help, and for hotels or other buildings having many burners on a floor is employed; but for other cases there should be burners which are self-regulating — each independently of all others. Such have been made, but they have as a rule been too delicate, and have readily clogged with water or deposit. The field remains, therefore, practically uncultivated.

Although nearly every six months brings out a new "mantle" for incandescent gas and alcohol lamps, it is generally, among them all, a matter of "tweedledum and tweedledee." Some give a greenish light, some a reddish; all are very readily shaken to pieces by the ordinary jars that take place in the average household — by which "family jars" are not meant; — and most of them gradually coat the chimney with a white deposit which is the *bête noir* of the housewife, and which indicates a gradual deterioration of the "mantle." Some are advertised as having been made of "the very best silk thread," which is usually not true, and would be of no importance if it were; for silk ashes are no tougher than blotting-paper ashes, and the only reason that a woven or knitted fabric is employed is to get a mantle (the Germans call it a "stocking") that has holes in it for the combustion gases to go through. Nothing short of fusion of the edges of the lines of alkaline earth which go to make up the structure would add anything to the tensile strength and durability of the latter; but it might be worth while to try and find a compound that would be more resistant to heat and the chemical action of the gas-flame. The hint is thrown out for what it is worth.

There are devices which will effect the instantaneous and simultaneous lighting of all the gas-burners in a church or other large public place, but they have so often proved unreliable that no inventor need be discouraged if he has thought of turning his attention in that direction. The trouble with many

of such devices is that they have relied too much on the durability of platinum sponge or its equivalent.

The "duty" of the ordinary electric arc lamp is comparatively low, and many of those in use are either tricky, or dangerous, or both. It goes without saying that anything new in this line must be simple and absolutely reliable as regards steadiness of burning, even when the current is not constant.

Is there a good joint for main gas-pipes? If there is, why is it necessary for the gas companies or the municipalities to send around a gang of men every year or too, to make borings along the pipe line and smell the earth taken up, to find out where the leaks are? These leaks, which are expensive to the companies, must be paid for eventually by the consumer of the gas that does not leak out, and they kill the trees the roots of which are attracted to their neighborhood by the proximity of the water-pipes that are usually not far off from the gas mains.

It would be a great blessing to humanity, and especially to those who work in factories, if there were some cheap and absolutely certain method of closing cocks and valves at a distance, by electricity, in case of an accident or other emergency. Many an accident could be prevented thereby. The falling of a lighted gaselier usually gives rise to a terrible blaze at the free end of the pipe; and the only way to stop this is to cut off the gas supply. To effect this, one often has to go into a dark cellar and hunt around for the cock. Further, the ability to shut

off the gas every morning when it is needed, without having to go "down cellar" to do it, would be appreciated in many a household, and such action would save much gas now lost by leaky pipes.

A material to add to denatured alcohol, by means of which that liquid fuel could be used as an illuminant without the employment of an incandescent mantle, would be very desirable if it caused neither smell nor soot.

All sorts of attempts have been made to get up incandescent lamps which will burn petroleum or alcohol; but as a rule they occasion much bad feeling on the part of those who have to use them. They generally smell badly and require too long to get them in operation; the best of them that the author has seen require at least a minute and a half from the time of applying the match before the mantle is incandescent. This minute and a half is often extended to two and a half, and in any case always seems much longer than it really is. The shops in which such lamps are sold, and in which the attendants gravely state that there is no unpleasant odor attending the use of the device, usually smell like a small edition of Hunter's Point. Of course if the petroleum contains sulfur (with an *f*, according to the Standard Dictionary) there must be a disagreeable odor with any lamp; and it would be unreasonable to expect that the vaporizer would eliminate the sulfur. The same is true of denatured alcohol as at present made; but it is not too much to hope that the denaturing will be effected by a process

which will make the alcohol absolutely undrinkable, without making it offensive to the sense of smell.

The ordinary glass lamp for burning petroleum is breakable, hence dangerous if upset. The metal lamps for the same purpose heat the petroleum, if they are kept burning a long time. A lamp which would not heat its contents by conduction, and which would be practically non-breakable if it fell from a table to the floor, would sell itself.

Chapter XV.

STEAM BOILERS AND THEIR APPURTENANCES

Power-users will herald the day which gives them a good automatic stoker for their boilers.

The methods employed to burn "bagasse" (the refuse of the sugar-cane as delivered from the mill) are crude and should be improved upon.

The smoke-consumer which will save fuel and lessen the smoke nuisance in those cities where soft coal is burned is yet in the future; and if it will do what is desired of it, and will, in addition, be applicable to locomotives, there will be in it what the boys on the street call "big money."

Firing with coal-dust and similar fuel has shown itself advantageous everywhere that it has been properly tried. It can be regulated almost as finely as is the case with liquid fuel. The fuel is cheap, and unfortunately only too generally on hand. If it pays the Germans and French to grind their good coal as it comes from the mines, mix it with pitch or other bond, and press it into fuel brikets, it should pay Americans to use the coal slack as it comes. The mechanism for feeding it into the fire-chamber should not be complicated nor take much power to drive it. And of course, as steam usually has to be raised before shafting-lines can turn, there must

be an arrangement by which the fire can be started and brought to full pitch without the aid of the dust-feeder.

And the safety boiler! Has the perfect generator of steam been produced? There are many excellent ones in use and some good ones coming out; but perfection is a long way ahead, and the success of those good ones which are already before the public need not keep any one from bringing out still better ones.

The apparatus generally in use to record from time to time the height of water in a steam boiler are too complicated and delicate, and also too dear. Further, many of them are easily made to give a false record. Such an apparatus must be like Cæsar's wife, above suspicion.

There are several devices on the market by which, in case a glass water-gage breaks, the steam and water will be automatically shut off by the unbalanced pressure; but there is in this particular much room for improvement. Some of them do not indicate when they are stopped up by scale or dirt in the communicating passages; some have no means of cleaning out such passages from time to time, to prevent their becoming choked.

The bursting of a live steam-pipe is usually attended with great danger to life and limb. This is especially so on board ship. There would seem to be room for a device that would close the shut-off valve next the boiler so soon as a break occurred which would let more steam out than the maxi-

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mum delivery when all engines or other steam-consumers were on.

A good cheap process by which steam boilers could be coated internally with copper after the last rivet and stay-bolt had been put in would add greatly to their tightness, and help in keeping them clean. The failure to cover any one place, however small, would cause galvanic action and corrode the iron or steel more than would take place without the coppering.

Chapter XVI.

STEAM ENGINES AND APPURTENANCES

The rotary engine which will use steam expansively, be durable, and not give trouble from leakage has not yet been evolved. There is a chance for it yet.

One of the most important inventions of the last twenty-five years is the steam turbine. It has, however, despite its great advantages of compactness and high speed, the disadvantage of not being reversible, and of being subject to rapid wear of the blades. These two points are worth looking into. The steam turbine, like all new daily papers and the proverbial mother-in-law, has come to stay.

A problem which is worth working at is the production of a mechanical substitute for the fly-wheel on ordinary steam engines or other motors, particularly those running at slow speed. This problem has been practically solved in pumping-machinery by the use of hydraulic auxiliary cylinders, which absorb power and give it out again.

Can you get up a good device which will automatically and instantly stop the engine and all moving parts connected therewith in case any one gets caught in the machinery?

The same principle that is applied to water-gages

should be applied to sight-feed oilers. Should the glass break, the connection with the steam supply should be shut off, so that no damage could take place by reason of the escaping steam; and the replacing of the glass should be easily effected.

There is still need of a good governor that will not change its gait by reason of defective lubrication, or dance when well lubricated, or when loosened up. Nearly all governors that are on the market are designed on the false principle that they and the engine which they govern must first go extra fast in order to go more slowly. Very often they are too dependent on the fly-wheel, so that for small changes of load they might as well not be there; the fly-wheel alone takes care of the variation. The perfect governor should keep the speed of the motor within one per cent of the normal to which it is set, whether the engine has normal load, or extra heavy load, or is running with no load at all; and this regulating-power should be maintained in the face of a ten per cent variation in the steam-pressure either side of the normal. To particularize: when with half load and normal steam-chest pressure of seven atmospheres the normal speed of the engine is one hundred turns a minute, this speed should not be raised more than one turn a minute with the load thrown off and under eight atmospheres; and conversely, with full load and only six atmospheres pressure the speed should not drop below ninety-nine revolutions per minute. Such changes are common in electric-lighting plants. Those in boiler-pressure

should not occur, but those of load are inevitable. The presence of a good healthy steam-hammer in a shop will drop the boiler-pressure very promptly.

The author believes that the future governor will be of the dynamometer type; that is, that it will operate by reason of changes in load, before the change in speed has taken place.

It is strange that the steam road-wagon has been so little developed. Self-propelling steam road-rollers are common enough, and some of them act as traction-engines also on good roads; but the steam carriage for ordinary roads is of the future. Perhaps the naphtha-launch motor idea can be adapted to service in our ordinary streets and highways.

Chapter XVII.

INTERNAL COMBUSTION MOTORS

Gas turbines are only in their earliest infancy. One thing that retards their growth is the lack of sufficient cooling-capacity for the internal portions.

Although the motor manufacturers have done much in the way of delivering small high-speed motors suitable for automobiles and boats, the aëronauts seem to think that the limit of lightness and speed has not yet been reached, and they demand further progress in these two lines. As this class of customers seem to be able to pay fancy prices, and as several governments are interested in the problem of dirigible balloons, there should be sufficient inducement to inventors to produce what is called for.

Despite the probability that the alcohol motor will be introduced in large quantities as soon as the cheap production of denatured alcohol is an accomplished fact, and despite also the fact that the alcohol motor has the great advantages of being more cleanly than the petroleum motor, and thermically more economical, because operating with a tenfold instead of only a fourfold compression, there is still room for thousands of petroleum motors in districts where the alcohol cannot be delivered at a low price, but which are right at the sources of petroleum.

Besides, no one knows in what manner the petroleum kings will meet the new competition. If denatured alcohol is freed from government tax in order to permit and encourage its use for power-generating, there is no reason why the petroleum price should not be cut down to cover the competition. The gas-works accord a special price for lighting-gas used in motors, and petroleum can be sold in the same way.

In connection with the invention of a good petroleum motor there is an excellent opportunity for the introduction of a small, light, high-speed motor for either petroleum or alcohol (not for both, as the two materials require different handling in order to be burned economically) to be used in the propulsion of street-cars. Here the noise must naturally be reduced to a minimum, and it would seem as though air-cooling was the only means available — or, at least, that it must be relied on as far as it will go. A speed of seven miles on levels would be sufficient for most cases, although there are places where ten would be welcome. There must be a reserve of power for use in starting the load on curves and up-grades; this may perhaps be done almost as well by a purely mechanical method as by having extra cylinder power.

There are many households where a tiny gas or alcohol motor could be used to advantage if it did not make too much noise. One fourth of a horse-power would suffice, and the motor should not permit of adjustment by the owner.

Chapter XVIII.

TRANSMISSION

There are on the market flexible shafts which run only one way. It often happens that this is just the inconvenient direction of rotation. It does not take any great degree of invention to make them left-handed instead of right-handed, but there might be some in getting up one that would run equally well in both directions and not loosen up after a few months' use.

There are many more or less ingenious and practical mechanisms for changing the speed and direction of motion of a driven shaft, but some are too complicated and some are too clumsy, while a very common fault is that those which change the speed do not change the direction, and *vice versa*. Mechanics would welcome a device by which one shaft could be driven from another by a simple, cheap, and compact device that would give a wide range of speed and also be reversible, and which, furthermore, could be adjusted while running, to effect the desired change or reversal.

There is still place for a substitute for the stepped pulley (miscalled "cone pulley") for varying the speed of the driven mechanism by a shaft of regular speed. Most machines that are driven by a stepped pulley have only three speeds. It very often hap-

pens that these speeds are not sufficient in number, and further, that they are not the most desirable ones; that is, the character of the varying work would demand five or six speeds, while those furnished are either too slow or too fast. The friction-devices offered to replace the stepped pulleys are generally too heavy and too complicated, or they slip where they should drive and stick when they should release. The Evans friction belt-pulleys are really conical, and offer as many speeds as can be called for between the maximum and the minimum; but their extremes are not wide enough apart, and the pulleys are too heavy and too expensive. Furthermore, they are not readily obtained. Outside of two cities, the author has never found a dealer who could supply them.

Supply-dealers seem to have no good belt-stretchers which will insure the tension on the belt being the same on both edges, and that this tension will not be too great for the lacings or even for the journals. The necessity of having the tension the same on both edges cannot be too strictly insisted upon, if the belt is to run straight.

There is place for a transmission on dynamometer light enough to be carried by one man, and which can be used in connection with belt-pulleys of all diameters and speeds likely to be found in the average machine-shop or factory. It should preferably give a reading which gives or represents the horse-power directly, without necessitating two multiplications to attain the desired result. In any

case, no more than one multiplication should be necessary.

Strange as it may seem, there has not yet been put upon the market a good ball-bearing or roller-bearing for engine-shafts and machinery generally. The manufacturers of bicycles seem to have got what is wanted, but in larger sizes the field is yet open.

Chapter XIX.

POWER IN GENERAL

Turbine governors have not been given the attention which they deserve. The decreasing amount of water which streams in new countries deliver, by reason of the cutting-down of the forests, calls for supplementing water-wheels with steam engines. This necessitates very careful governing of both. The same cause which diminishes the average power of a stream makes it more liable to floods in springtime, when the snow melts; and here again all turbines need governors. The increasing use of electric lights, even in the forest where lumber is cut, makes regulation of the turbine or water-wheel which drives the dynamo all the more desirable.

Solar motors could be very well used for pumping water in those countries where the sun is very hot, and running water scarce.

So far the accumulation of power has had too limited an application. There is a great range between the tiny pocket battery and the immense accumulators used in plants for electric light and power; but not only the number of applications, but the number of modes of application, are too limited. What is needed is a method of conveniently and economically accumulating the power of the lightning, the wind, the tides, freshets, and the heat of

the sun. This is a wide range, and the means of accumulating the various sorts must be correspondingly various; but the general problem calls for the accumulation of electricity. In the first case there must be a "step down" unparalleled in the history of transformers; in the second and third there is already present mechanical power which must be converted into electricity in order to be well stored and conveniently distributed; and in the fourth case heat is present and must be converted into electricity only after it has been made to take the form of mechanical energy.

Chapter XX.

MOTOR CARS AND BICYCLES

Just as the speed and lasting powers of a horse are limited and measured by the condition of his front feet, so with the motor-car: the tire limits and measures what it can perform. Motor manufacturers have done wonders — more than was expected of them; and tire manufacturers have also done wonders, but it has been expected of them that they set aside the laws of inertia and friction, and that they have not done and will not do. The shocks incident to the jumping motion experienced at high speeds, even on good roads, are sufficient to burst the strongest and most thoroughly air-cushioned tires; there is no rubber or canvas that will resist broken glass and bottles, and there is no way by which the momentum attained by a car when going at high speed in one direction can be arrested without the car sliding or tipping. The best that the manufacturer can do is to make tires which shall lessen the sliding and to a high degree withstand the wear. If the tire can be given a good grip on the road surface, the driver will have some show to turn the machine, even although the road is not elevated on the outer edge of the curve. And that is all that the tire manufacturer should be

asked to do — provide a tire that will stand rough usage and dig in.

The most frequent cause of pneumatic tires (what a misnomer!) is the fact that India rubber as used therein is not air-tight under great pressure. There may be some preparation which would make it so; if there is, there is money therein.

There are several makes of motor-cars in which it is almost impossible to tell from the driver's seat how much benzin or alcohol there is in the tank. For these special machines there is a loud call for some device which would attain the desired end. It would be a convenience on long tours, and facilitate matters at custom-houses on the frontiers.

There are several sorts of sparking-apparatus on the market for benzin and alcohol motors, but there are few that are satisfactory, especially where the driver is not used to electrical apparatus. Something more reliable and more easily adjusted, repaired, or replaced is demanded.

Singularly enough the motor-car has become a luxury and a convenience before being adopted to any great extent for common work. There should be an even greater market for automobiles for farm and other hauling purposes — to say nothing of the army in countries burdened with such a thing — than at present for sporting and pleasure-seeking purposes. They would not bring such high prices per pound, but there would be more pounds per piece, and more sold. And the purchasers would be very much less exacting as to performance.

Most of them would know very little as to the capacity, and almost nothing as to the duty. They would want something that would carry a load or haul one, or both, and that could be run by a hired man and repaired by a country blacksmith — that is all. This machine should be able to run on ordinary to miserable roads and occasionally cross a harrowed, if not a plowed, field; must be a good grade-climber, and have a spark-arrester; and if possible it should be able to act as a driving-engine for a thresher or a cutting-machine.

Among the other improvements that would be welcome on automobiles would be a steering-apparatus which would wear equally in all parts, and which would have the distinguishing feature that for short turns it would have a stronger leverage to turn it than where there is only a slight swerve. Another feature should be that the steering-gear should stay fixed in the last position in which it is placed, so that if the driver's hand is taken from the wheel the machine could not be thrown off its course by an obstacle, as a stone in the road.

There is no particular pleasure caused by a motor-car making a noise in running. Sometimes the noise is caused by the exhaust, and sometimes by the gears. The exhaust is the greatest sinner in this particular, and a good muffler would be appreciated by the manufacturers and owners — to say nothing of "the man in the street."

While there are all sorts of instruments by which the power developed by steam engines — including locomotives — and water-wheels may be accurately

measured and even recorded, the automobile is at present devoid of any contrivance which will give an idea of how much power is developed at various speeds and with various loads, on different kinds of roads, and in running on level stretches or climbing hills.

But what would interest the owners of an automobile still more than a power-meter or dynamometer would be a recording-apparatus which would prove at what speed the car was going at any particular moment. This would do away with all disputes with "auto-cops" and others interested in fining drivers for excessive speed, and would also prevent disputes with automobile-cab drivers as to whether they were making the legal time or not.

Another attachment for fast motor-cars would be a speed-regulator which would not only fix the number of turns per minute made by the wheels, but also set a limit to the speed at which the machine could possibly be driven. This would wipe out of existence many controversies as to the speed. If the owner of a machine locked the device to prevent it being driven more than at a certain speed, his chauffeur, or whoever he may happen to let, lend, or otherwise confide it to, could not exceed that speed and get him into scrapes with the "minions of the law."

As a rule, the question as to whether or not a lady may ride a bicycle — and especially a man's wheel, which is much stronger, safer, and more easily driven — has its basis in a false sense of modesty, which

after all is a relative term, as witness the attitude of the Japanese as regards exposure of the neck and that of the Turks in the matter of showing the face. Further, the whole affair is too much bound up with the clothes question. Be that as it may, no one can argue a lady out of her ideas as to what is modest and proper — and perhaps it were better so. But what can be done is to afford those ladies who are opposed to the bicycle (or who are controlled by others who are in such opposition) an opportunity for transporting themselves from place to place on a wheel which would give Mrs. Grundy not the slightest chance for talk. A wheel propelled by the arms, and made as well in all particulars as the average bicycle with pedals, would find good sale — and also act as an advance agent in winning to the use of the pedalling bicycle many who now go only on "Shanks' mare."

There are offered for sale no end of locks for bicycles. Some of them are so complicated that they get shut and refuse to be opened, even by the authorized owner. Others are so flimsy that a good pair of cutting-pliers, or a healthy twist with both hands, disposes of them. Some are "confidence locks"— one can always be confident of being able to pick them with a hairpin if the key be lost. There should be ingenuity enough in the country to produce something better, and at a price which would not be prohibitive of large sales.

The numerous cases of unauthorized persons taking a motor-car out of the garage, or running off

with it in the open street in the absence of a caretaker, should make inventors look out for a lock on the starting-gear, to prevent any one but the duly authorized person setting the car in motion.

Perhaps least, but at any rate last: the average car raises too much dust. This does not annoy the occupant, but it does help to raise prejudice against the motor-car on the part of those not so favored as to possess one. The cause of the dust-raising is usually in the design of the frame and running-gear, as it will be noted that some cars raise no dust where others at the same speed are insupportable to those behind them.

Chapter XXI.

STREETS AND ROADS

An improved roadway is needed in this climate: something that will wear as well as stone, be as easy to pull on as asphalt, and give the horses' feet a good grip so that they will not slip even in rainy weather.

A good enough monolithic street pavement has not yet been laid. Cobblestones would vanish if we had something perfect and in one piece to take their place — something which would give the horses' feet a good grip while allowing the wheels of vehicles to run smoothly without great resistance or noise.

There is a great difference between being smooth and being level or flat. There are many asphalt pavements — both on the roadway and on the trottoir (or footway, an it please you better) — which have been "slicked" by hand until they are smooth; but every rain shows by the puddles that it leaves that there are sinks therein. A machine to smooth down the hot asphalt as soon as it is laid, so as to leave the surface free from local depressions, might prolong the life of the pavement, and would certainly add much to the comfort of the public.

And while on the subject of asphalt, the attention of inventors might be drawn to the desirability of a compound to take the place of the present mix-

ture, which would be smooth enough as regards the wheels, and yet give the horses' hoofs some little hold, especially in wet weather, so that it would not require sanding — which latter operation is expensive, and makes dust and mud after the rain is over and the street dried off.

There is no good machine for ramming paving-stones. It should be so light that it could be drawn by one horse on ordinary unpaved streets, and should be driven by a steam engine or an internal combustion motor.

Six or eight husky men can ram paving-stones pretty firmly; but getting the blocks out again is slow work, if they happen to be a good fit when they are put down. What is needed to supplement the ramming-machine — and it could be used even before this makes its appearance — is a stout and practical tool to take the stones up, as for instance where it is necessary to remove one every five feet along the line of a gas-pipe, for the purpose of making borings to test for gas-leaks.

There is no city in the world which has any considerable amount of snowfall that is provided with adequate means of getting the snow and the accompanying dirt out of the way promptly and at slight expense. Until such method is produced, traffic in our greatest cities will suffer congestion or complete stoppage every time there is a heavy snow — particularly if it come with no warning.

And the street-sweeper. Cannot some bright American bring forward a machine which shall do

more than simply brush the dirt to one side or the other and leave thin windrows? There is demanded something which will take the dirt up bodily and put it into a box to be carried with it until the machine has reached the end of the route, or the box is full.

The horseshoe of the present is an abomination. There needs to be something which will save the hoof from undue wear and breakage, while at the same time permitting elasticity of movement when the weight of the body is alternately borne upon and taken from it. The present system of shoeing is not humane, nor is it economical.

The horseshoe and the perfect roadway for the horse's foot to travel upon having been provided, there should be produced a better wagon-wheel than at present exists. While American wheels are the best in the world, American roads are in the same or a greater proportion the worst; and there is needed a wheel which will have a strong yet elastic tire and be then less easily buckled than those which we have at present.

The safety appliances in front of tram-cars, to prevent foot passengers being run over, might have been sufficient in their day,— which was the day of horse traction,— but now that cable and electric traction are the rule they are highly inadequate. Here we have increased danger with no improvement in the precautions for safety. It is true that many tram-car companies prefer to pay damages for accidents rather than equip all their cars with

safety devices; but here the fault lies not any more with the companies than with the public at large, and their representatives in city councils in particular; for these latter are apt sometimes to demand impossibilities, and have also been known to have personal interest in inventions that are either worthless or cost by far too much in proportion to their real value. The author is of the firm belief that when inventors do what is expected of them the tram-car companies will do their duty.

Chapter XXII.

BUILDING

One of the best opportunities for inventors to display their genius is in the production of a machine for laying long courses of bricks in straight walls. It is only required that it shall produce an ordinary bond, and have some slight adjustability for different sizes of bricks — not in the same wall, but as between one wall and another; although for Germany even this is not necessary, as, there, bricks must be of the regular standard dimensions prescribed by the authorities for the whole country.

It goes without saying that the machine is to lay the mortar. Hand-pointing would be permissible. The machine would only have to satisfy the requirements of contractors having long reaches of straight wall, with openings for windows and doors as required. These the machine would have to arrange for, just as a typewriting-machine provides spaces between the sentences. Hand-work is at the rate of from fifty to one hundred and twenty bricks per hour, according to the size of the bricks, the skill or the workman, and whether he is paid by the day of the thousand. It would be sufficient if the machine would lay double the maximum capacity of a man; even one which would do only one hundred and

fifty an hour would be welcome, as freeing the masters from the tyranny of the unions, and of course incidentally enabling work to be done where skilled laborers could not be had at any price.

The heavy and costly scaffolds which are called for by law in some countries, and by custom in others, for use in painting the exterior of buildings, are too cumbersome, and prolong the work too long. Something should replace them.

An arrangement is called for which would satisfy the building authorities, where such exist, and which would enable the house-painter to paint a wall without calling in the help of so many laborers. Nowadays, the scaffolds used in Germany, for instance, take five men a day to put one up and three men a day to remove it where the actual work of painting only takes two men two days. The first requisite is that it shall be absolutely safe; that is, it must not fall down of its own motion, nor be readily knocked down by a runaway team; and there must be no opportunity for the workmen thereon falling off by inadvertence.

Roofing-paper — too often miscalled "felt" — is needed, for temporary buildings and for the under covering of permanent ones, that shall be thoroughly water-proof and fire-proof,— that is, highly spark-proof; incombustibility is not called for, and while being easily laid, it must have considerable resistance to tearing. Cheapness must be among the requisites.

A roof made of such paper felt, or whatever it

might be called or miscalled, would go well for temporary exhibition buildings, wharf sheds, etc.

Hardly a month goes by without some architect, Common Council, or other person or body calling for a fire-escape that can be permanently attached to the building, but when not in use shall lie folded down flat against the wall. When needed it must be readily opened out to the position for use, and not fold back again until this is required. It must be so constructed that it would not require an athlete to use it, even in sleety weather; and should be capable of being brought into position from the building itself without affording burglars extra facilities for entering the windows which it served.

It ought not to be very difficult to produce a machine which would paper the walls and even the ceilings of ordinary rooms, and do it better than is now done by hand — which, unfortunately, is not saying much. The advantage of the machine should not lie so much in the amount of work which it would do in an hour, but in the greater smoothness with which it laid the paper.

One of the most prolific subjects for patents in countries where hinged shutters and sash are the rule should be proper fastenings therefor; but, unfortunately, the bill is not yet well enough filled. The desired fastening should hold the shutter closed against any attempt to open it from without, and open at any desired angle.

The spring-balanced roll-shutters for shop windows, that roll up so easily because the spring so

nearly exactly balances the weight of the slats, have earned a great deal of money for the inventor and manufacturers; but who shall say that they are perfect? And who could say that there is only one way of accomplishing the result — or that the already patented way is the best one? The history of all invention is to the contrary.

There are some quite good roll-shades for balconies — designed to keep off the wind and to some extent the sun, at any rate when its rays are nearly horizontal. They are very much too expensive, and often much too clumsy; and furthermore, their length is fixed. There is no means of joining two or more sections to make a continuous screen; and sometimes this would be very desirable.

No one can claim, with any great hope or chance of being believed, that the present system of holding window-panes in the frames with putty is handsome. It certainly is much more convenient than the old way of soldering lead rims around the pieces; but modern artistic building would take kindly to this latter again if it were not so expensive. Is there a possible way to hold the panes water-tight and air-tight in any sort of frames, and produce a better artistic effect than the putty plan?

Sir Boyle Roche, when member of Parliament, said, among other things which have been handed down to us as good specimens of thoroughbred Irish bulls, that a man could not be in two places at once, *barring he was a bird!* Those of us who have had to get up in the middle of the night and close

the shutters or the hinged windows by reason of a sudden rain-storm, or who have come home and found that in their absence the rain has done damage by reason of open windows, will see just why a demand has been expressed for an arrangement by which the shutters or the sash would close automatically when a heavy rain came on. Things which were apparently more impossible are being done every day.

There are door-closers and door-closers; but the perfect one has not yet appeared. The most efficient part of many of them is the advertisement that they give their makers under the pretext of notifying the public that it is not necessary to take the trouble to close the door, as it is provided with Smith and Jones' celebrated patented automatic harmonic door-closing device. The trouble with most of them is that they do not effect the final and thorough closing, unless they do it with a bang. Others require that one possess an intimate knowledge of the laws of the parallelogram of forces as applied to the toggle-joint, in order to put them on properly.

The sash-cord and pulley method of holding windows at any height is very crude, and inventors might as well profit by that fact and bring out something which will be better.

Some day somebody will produce a system of glazing without putty, and will receive the thanks of all of us and the dollars of many of us.

Chapter XXIII.

KERAMICS AND GLASS-MAKING

Although hundreds of brick-machines have been produced, and brick-machines are demanded by manufacturers, there is none which has been very generally adopted. *Verbum sap.*

Terra-cotta pipes of from six to ten feet in length, and with smooth glazed inner surfaces, would be by far better from many points of view, for smoke-flues and water-closet pipes in houses, than the short lengths now used, which call for so many joints, which the settling of the building may make no longer tight. A process by which such pipes could be made and burned without getting oval or crooked would be worth trying to attain.

Fancy-colored (not glazed) bricks are demanded and not produced. Which of my readers will bring them out?

A good process for enamelling building-bricks on only one face, or on two, would take well. At present the results attained leave much to be desired both as regards the appearance of the bricks and in the matter of cost of manufacture. There are by far too many "seconds" both before and after burning; and these are hard to dispose of, and even to use in many ways. Once covered with the colored slip, no one likes to have them among ordinary

bricks, as this increases the cost of laying except for partition walls, or other places where the variegated appearance of the mixture of kinds would make no difference.

In nearly if not quite all brick-machines of the "sausage," "bar," or "screw" type — that is, those in which the clay is pugged and forced out through a die into a long bar which is then cut into proper lengths to make one brick each — there is encountered the great fault that the wire or the knife that cuts the bar leaves on two edges a projecting fin, and, further, is apt to score the face along which it passes. This is particularly the case where the clay has stones or roots therein, as they are dragged along with the wire or the knife, and ruin the appearance of the brick. To attain a smooth cut without fin on the edges or scores on the face would be well worth trying for. Whether this result was attained by avoidance of the fin or scores, or by smoothing them off automatically, would make but little difference in the finished product ready to dry and burn.

In making so-called "china" ware, the mass is subject to great shrinking in drying, and no matter how slowly this takes place, there are apt to be cracks formed in the edge of large flat pieces such as meat dishes and even the larger sizes of plates. The shrinkage amounts to about ten per cent in diameter, and this has to be allowed for in making the plaster molds for the mass. If, now, there could be some

addition to the mass to lessen this shrinkage, it would be welcomed by the potters.

Porcelain factories very much need a process by which to free the china clay (kaolin is the proper name) from iron oxide, which occasions discoloration of the ware, so that many clay deposits are absolutely useless for white ware, although in the matter of toughness and smoothness they are better than those now employed for white ware merely because they are absolutely free from iron.

If some one would invent a process of glazing ordinary pottery without the danger of lead-poisoning which is now one of the drawbacks in the industry, he would earn the gratitude of the workmen and manufacturers.

The mechanical manufacture of lamp-chimneys, and particularly of those intended for lamps with tubular wicks, is greatly to be desired. The chimneys specially mentioned have a shoulder, which increases the cost of manufacture by hand.

Is the idea of flexible glass too fantastic for the modern inventor? If the ancients could harden copper — which is more than we can do — the fact that a thing has not been done in modern days should be no proof to us that it cannot be done.

The secret of making "Scotch" gage-glasses seems to be too much of a monopoly.

Chapter XXIV.

TEXTILE*

The cactus and other Mexican fiber-bearing plants have not yet been made to yield up their fiber for textile purposes at a cost low enough to make it worth while to work them.

A good substitute for horsehair (as, for instance, for making cloth used in the lining of men's coats) would sell well, as horsehair is dear and not long enough to be easily woven. Further, the sharp-pointed ends of the hair come through the garments stiffened with the cloth.

A good substitute for the fibers of the broom-plant (*Ginesta germanica*) would be welcomed, as the broom fibers are difficult to free from the fleshy portion, and to clean.

Covering linen and cotton threads with a solution of silk, so as to produce an effect quite closely resembling that of silk itself, has become a very important and paying industry; but by reason of the popularity of the product there is a demand for still further steps. At present the sheen of the fabrics is inferior to that of silk, and naturally it lessens with wear. The time will come when there will be discovered a substitute for silk that will be cheap

* See also the chapter "Inventions for which Prizes Are Offered."

enough to permit its being more thoroughly incorporated into the threads. There is a process which very closely imitates the dissolved silk effect, but dispenses entirely with the latter material; and in this direction also there is room for progress — and also for other methods producing the same effect without violating the process patents which are now reaping such harvests of profits for inventor and manufacturers.

Calico-printers call for a cheaper material than Senegal gum for filling the fabric before printing.

When an umbrella-covering woven in one piece, as corsets are now produced, is put on the market the inventor will find the market waiting for it.

And while the skilled inventor of textile machinery is about it, why not produce a stocking all woven in one piece, without any seam, and with double toes and heels, and extra strong knees for little folks?

Cloth wearing-apparel that will not shrink and get out of shape when rained upon, and shoes that may be wet without losing their shape and getting stiff, would be good things if they were, in addition, somewhat permeable to air, yet at the same time moderately water-proof.

A process for cleaning cotton lace without wetting it is called for by those interested.

A prize is offered for the best method of removing dust from rooms where flax, hemp, and jute are hackled. (See Chapter XXXIII.)

A machine for spinning asbestos better than those now used would find no very extended sale, but

would bring a high price. A Philadelphia carpet-dealer once said to the author that spinning was getting to be too much of a fine art, that the manufacturers of carpets could spin almost anything except sand! For all that, asbestos spinning has not reached a very high grade of perfection.

And when it comes to spinning moss fibers — some of which have really very good qualities adapting them to textile purposes — there is even greater lack of good machinery than for spinning asbestos. The material is, to be sure, very varied, but if there were good machines for spinning any one class of moss, manufacturers would see to it that they got sufficient quantities of that sort to enable them to spin it regularly.

"Beaded" threads — that is, such as have at regular distances beadlike enlargements somewhat resembling beads strung on the thread — would be welcomed by the manufacturers of fancy goods, such as laces, curtains, fringes, etc.

If you can strengthen the sails of vessels by some composition which will not stiffen the fabric you can get rich.

The chemical philanthropist who produces a compound which will fireproof and waterproof textile fabrics at a low cost, and without changing their appearance or feel, ought to be a millionaire before his invention has been long on the market. If this can be done without making the fabric air-proof as well, so much the better. Garments which will shed the rain, and boots which will exclude snow, while

permitting of the passage of air through their pores, would be very desirable.

The author's namesake and relative, Robert — afterwards Sir Robert, but nicknamed "Parsley-leaf" — Peel, was the inventor of calico-printing; and his grandfather, the inventor of the "discharge" process in that line, bought from Peel the patent for the kingdom of Ireland, and founded the Irish calico-printing industry in the neighborhood of Belfast. The methods then employed were very primitive: the blocks were about a foot square, and cut by hand, and the printing was done by hand, register being secured by pins. The invention of the calico-printing roll, with the necessary machinery, followed long after, and has all along been handicapped by the great expense of engraving the rolls. A photo-engraving process for making the cylindrical printing-surfaces of zinc or copper would give fresh impetus to the industry, and ought to bring wealth to the inventor.

The first Napoleon said, in speaking of difficult tasks, that nothing was impossible, except tying a knot in the middle of a string both ends of which were held fast. This is very much like the problem which is set in making lace by machinery; but the thing can be done, and has been done as far back as 1878. Still, there is room for great improvement as regards the size and cost of the necessary machinery; and in this line the consumption of the product would be so great that the successful inventor of the

lace-weaving loom should be able to realize well from his inventive genius.

There are plenty of wire looms, such as they are, that weave ordinary plain-mesh wire gauze and sieve material; but as yet there is an opening for a loom that will weave fencing and such material in fancy patterns.

A great improvement in looms would be a device by which the empty shuttles could be automatically removed and replaced by full ones — without, of course, stopping the loom for the change. The capacity of the loom would be increased, and considerable labor saved.

A machine for making fish-nets seemed at one time an absolute impossibility; but the problem has been nearly solved by the lace-makers, and there is no reason why fish-nets of mesh from half an inch to four inches should not be made on one and the same machine. How the knot is tied is a side issue; the main thing is that the meshes shall be of equal size, and that the knot shall not slip.

Cloth-manufacturers express themselves as not fully satisfied with the present machines for singeing by means of gas-flames.

Chapter XXV.

WRITING-APPLIANCES

Every year brings out a typewriting-machine — and mostly, in nearly all respects a good one. But there is always room at the top — and the top has not yet been reached. The original typewriting-machine — that of Dr. B. F. Palmer, the inventor of the artificial arm and leg, samples of the writing of which machine are still preserved at the Franklin Institute of Philadelphia — was about the size of a so-called "cabinet organ," or let us say of a small roll-top writing-desk; and it did what then was considered wonderful work. Since then, progress has been "upwards and onwards," as Fourth-of-July orators say; so that the No. 5 or No. 6 of each manufacturer is as much better than the No. 3 or No. 4 as these were than the No. 1 or No. 2 of the same make. But neither manufacturers nor dealers nor customers are yet satisfied. They demand a machine that shall have visible writing; will write on letter-sheets, or freight manifests, or post-cards, or envelopes; shall manifold well; shall have two or three kinds of ribbon (as, for instance, copiable and non-copiable, or red and black); shall have more than two different line-spacings, and replaceable type, so as to be able to write with Polish or Portuguese, German, or Esperanto, or any code

alphabet required, by simple change of the types or wheels. This machine does not exist as yet. It may never exist; but the probabilities are that it will. When, in 1892 or so, the writer called for a typewriting-machine that would write in books of record, the idea was scoffed at; but two years after, McCreary wrote him to come over to Jersey City to see the new-born infant — which then wrote in books, on books, on pocket-handkerchiefs, and even on the walls and ceiling of the room. Now, the purchaser can have his choice of half a dozen varieties of machines that will write in books, make out bills, etc.

For all that, the book-writing machine is not yet just what is needed. Its work on narrow books bound by the ordinary "case" plan, which do not permit of being opened out very flat, is not what it might be. And it is too big.

What would not the average daily newspaper publisher and editor give for a small typewriting-machine which the reporter could take with him when in quest of news in that delightful class of townlets denominated "nests"! There, no nimble-fingered typist (good word, that; British) to take down his "story;" the lead-pencil and the pad of unsized paper must suffice — and here there are chances for error, to say nothing of the greater time required. The commercial traveler, also, would like to have a small machine — not a toy — by means of which he could write to his "house" those wonderful romances about battle, murder, and sudden

death having prevented him from sending in orders this time, but other circumstances rendering the probable results of the next visit exactly epoch-making.

It is too much to expect that the average music-composer would ever learn to use a machine, when (his eye, like that of the poet, "in fine frenzy rolling") he is evolving melodies to bring him fame and riches. But there would be a good market for a machine by which the choir-leader, or the band-master, or the leader of the theatre orchestra, could have the various "parts" written out rapidly and neatly on short notice, by some one who was at once musician and "operator." Such a machine would also enable the cheap reproduction of amateur and fleeting compositions by the hektographic and mimeographic processes.

Electric drive for the typewriting-machine can be accomplished. There are several operations which could be electrically carried out — shifting the carriage and throwing the roller by pressing a button are perhaps the easiest. Before his death, Dr. B. F. Palmer was at work on a tiny machine by which the actual work of throwing the type-levers was done by electricity; all the operator had to do was to touch the key with a stylus. The keyboard was about four inches square, or less. That was in 1895; but the electrically driven machine is as yet hardly an every-day acquaintance.

With nearly all writing-machines there is a great fault,— all the letters and signs that have but small

area get the same blow as the others, so that they make a deeper impression and the imprint is unduly full. Thus the period is usually driven clear through the paper, while the *m* is printed more faintly than the *i*. A variable touch would enable the operator to give every character exactly the same impression, and greatly increase the legibility and the beauty of the writing. As it is now, one can tell a real typewritten letter from one that has been produced by any of the now familiar processes by turning it over and seeing if the periods stand out in relief like the letters on printing for the blind.

A still further desirable feature would be a variable feed for the carriage, by which the *m* and other wide letters would get more room than the *l* and other narrow ones, while the letters of medium width, like the *n*, would get a medium amount of feed. This problem has as yet baffled the inventive skill of the veterans of the typewriter industry.

Typewriters make a dreadful noise. How can this be deadened, so that every business office may not resound with the unceasing rattle of the keys? Any one of the big companies that sell such writing-machines would gladly pay $50,000 cash for a satisfactory solution of that puzzle. There are many professional men who would gladly use the machine for confidential and original work, but the "clapper, clapper" distracts their ideas.

If the name of the duplicating-devices now on the market is legion, there is at any rate an elegant sufficiency of them, as regards quantity; and the pe-

culiarity of them all is that whichever of them one has, one wishes for the other. One kind yields copies that gradually show oil through on the reverse side of the paper; and if a hundred sheets are printed, there must be a hundred sheets of blotting-paper, between which they must be kept until they see fit to dry. Another type leaves the sheets coated with a thin film of glue size, which makes them curl as if that were the chief object in using the apparatus. And so on through the list. The ideal process must be equally suited to pen and ink or typewriting-machine; must not smear or curl the paper; and must yield copies which are of equal strength from the first to the last; and if possible it should be adaptable to printing two or more colors at once. The demands are exacting; are inventors afraid?

The hektograph ink in general use has the aggravating peculiarity of being practically indelible if it gets under the finger-nails, but readily bleaches out of documents printed therewith. Furthermore, the color is characterless. Perhaps the aniline chemists will produce something not quite so dependent on glycerine for its consistency, and on the present aniline compounds for its permanency.

The fountain-pen is responsible for rather more profanity, for its weight, than any other object in existence. But perhaps it would behave itself better if it were treated better — as, for instance, by being loaded with an ink that was jet black and would not clog the fine passages.

Any government that has a postal department is ready to hear from inventors who have an abso-

lutely indelible canceling-ink for postage-stamps that will fulfil the requirements of not drying up hard on the pads, not clogging the letters of the stamps by which it is applied, and not smearing off from one letter to another. As it is now, most of the canceling-ink in use can be removed by ordinary soap and warm water. If the stamp is not printed with a plate-ink that is also easily soluble in warm soap-water, the opportunity for fraud is great. But such plate-inks as are soluble in warm soap-water do not yield sharp impressions; further, are apt to bleach out by exposure to direct strong sunlight. That is the status in this line; it remains for those who think that they can deliver what is called for to attempt it. "Faint heart ne'er won fair lady."

It is thirteen years since I made my first call for a good red pencil; and despite the thousands of inventors who have read and acted on my list of suggestions as to what to invent, and despite the fact that my suggestions have brought out many important inventions — such as the typewriting-machine which would write in books, and the device to enable a train to be braked from the switch-station instead of only from the train itself (as for instance, where it has passed a danger-signal) — the good red pencil does not exist. Despite the fact that in every double-ended red and blue pencil the blue end, although used more than the red, lasts longer,— so that the inferiority of the red end is patent to every one who has used such pencils,— the void remains unfilled.

Chapter XXVI.

PRINTING

Perfection in typesetting-machines, which would make books cheaper and lessen the cost of all printed matter, is far from being reached. Machines which will set up a page direct, and do the justifying at the time the line is set up, ought to bring fame and fortune.

Half-tone printing needs the inventor's aid. As it is now, ordinary presses for printing from type forms must have engraved blocks, the printing-surfaces of which are either type-high or below that, and print from only those portions which are type-high, losing the half-tone effect.

Are you able to invent an ink-distributing roller for printing-presses, superior to those now employed?

It might seem impossible to print several colors at one impression, or at one passage through a printing-press, but many things are being done now which were at one time considered impossible, or at least impracticable, and perhaps this will prove to be one of those things.

Printing on sheet metal has not been so thoroughly developed as it should be. There is plenty of room here. The process should preferably be not lithographic, but from relief surfaces.

Can you make printing-surfaces out of some ma-

terial which shall be as light as celluloid, and as easily molded, without being inflammable?

There is room for some one to produce printing-types having a hard face and a body which is not so slippery that the letters will hardly stand on their feet.

There is no cheap process for making borders and tint-plates, for stocks and bonds, that would be impossible to imitate. There are many enterprises that have but a few certificates of stock, where it would not pay to have an expensive plate engraved by the geometrical lathe, and book-printers (that is, printers on relief presses) would welcome a method of making them independent of the lithographers and steel-plate printers.

The black borders on mourning notices, writing-paper, envelopes, cards, etc., are all put on by a very tedious hand process. This delays the issue and unduly increases the price. Who will be the first in the field with something better?

Alois Senefelder's invention of lithography, or printing from stone, was based on the fact that you cannot wet grease or grease water; but for many decades it was practised with only stone as the printing-medium. Later, zinc plates, and, still later, sheet aluminium, were employed in carrying out the same broad principle; there are, however, many classes of work where metal is unsatisfactory. But the high price and great weight of the true lithographic limestone are a bar. The invention or discovery of a new substance for this stone is a prob-

lem well worth the devotion of time and attention thereto.

Lithographic printing-ink has the disadvantage of not being as fully black as the ink used in plate-printing, which is in itself very thick and black, and being laid on in heavy masses, corresponding to the depth of the incised lines in the steel or copper. The production of a stone-printing ink that would produce, when laid on in thin lines, the same jetty effect that is observed in plate-printing would be a benefit to lithographers who aim at high-grade work.

The progress of the idea of organization in all business calls for keeping copies of many more documents and slips than were formerly used. This means the use of either copying-ink or carbon-paper. Where the entire document is newly and specially prepared, it can be written on the machine; but where there is a form to be filled out, it is usual to copy in the press by the wet process. Generally the ink employed in printing the forms is purple; sometimes it is green; neither of these colors is highly desirable. But the copiable black printing-ink, either for the lithographic press or the ordinary "book" press using a relief printing-surface, does not exist. It goes without saying that if it were invented it would find no difficulty in being introduced.

If there is any one process which is more tedious than another, it is plate-printing. There are power-presses for using incised printing-surfaces, but those of the roller type at once curl up the average thin plate, while those of the stamp type soon totally

destroy it. Both kinds do good work with printing-surfaces specially prepared therefor; but these are practically embossing-dies, and cost too much for the average job. The remedy must be found in the press, so as to enable the use thereon of plates already in use.

The art of rapid stereotyping for daily newspapers is rather crude in its results, and although very rapid, could stand considerable improvement without becoming too fine for rapid work. Every second saved in the casting, and especially in the trimming of the plate curved, is worth considerable money to the proprietor of a daily newspaper having an energetic rival. A number of years ago, the writer was very handsomely paid for two weeks' work resulting in a saving of seven seconds' time in the preparation of the curved stereotype plates of the *New York World.* This saving in time enabled that paper to be cried on the street a few minutes before other papers receiving the same telegrams at the same time, and having equally good composing-room facilities. The idea was not patentable, and could not be kept secret more than six months from the rival dailies; but during that time it was a feather in the *World's* cap.

Chapter XXVII.

PHOTOGRAPHY

Photographers, especially those of the amateur and dilettante classes — many of these latter have more knowledge of the art than most professionals — have long watched with interest the "telephot," or long-distance objective, which enables photographing in comparatively large size and in great detail small objects at a distance, or large ones which at a very great distance subtend but a small angle.

In the best-known form — that of 1892 or so, as proposed by Dallmeyer — it is in general principle the optical arrangement of Galileo's telescope of hundreds of years ago; or, to come down to modern days, that of the common opera-glass. There is in this latter a large concave or diverging lens of short focus, and a so-called eye-piece having a short-focus lens. If one turn one of the tubes of an opera-glass wrong end to, and apply it so as to throw an image on the ground glass of a camera, there will be obtained a much larger image than could be got with the same extension of the box, using the ordinary objective. But the definition will be very bad. The problem for the inventor of to-day is to produce cheap telephot objectives that will give a large image with sharp definition. The spherical aberration must be corrected for all focal lengths; which

is where knowledge of the art comes in. By proper attention to the adjustment for both positive and negative spherical aberration, there can be attained any desired amplification of the image. Should the combination of lenses, or their adjustment, be such as to produce a field which is convex towards the lens (the reverse of the usual curvature), this can be counteracted by using a small stop.

A peculiarity of the results obtained by the use of such a lens is that by its use it is possible to get photographs that are practically in isometric projection — which would be of use to architects and to military men.

The remarkable extension of the photographic industry makes it desirable to decrease the cost of grinding photographic lenses. Of course, the machines which would accomplish this result would find purchasers among the manufacturers of spectacles and opera-glasses as well. The requisites are the production of perfect curves of exactly the character prescribed — for spectacles either spherical or cylindrical. The same class of machine should serve for both roughing and polishing; and the result should be approximately that necessary for telescopic and microscopic work. The machine-made lenses would then require none of the testing and repolishing with the aid of the finger-tips necessary for the highest grade of lenses.

The work of Meissenbach in Europe and Louis E. Levy in America has wonderfully developed those photo-engraving processes which enable our news-

papers and technical journals to be illustrated so fully and so cheaply; while our permanent literature and the catalogues of manufacturing and commercial firms show the benefits of the new art. But there is much yet to be done. Blocking has not yet been brought to the degree of cheapness and convenience which would please the photo-engravers; for as it is, the nails work loose when the blocks are dry, and often, as in the case of half-tone cuts, there is absolutely no place to drive them, unless one leaves therefor a margin, which increases the cost of the block to the consumer and often takes up more room than he had reckoned for.

The so-called "half-tone" process for reproducing photographs and wash-drawings, as well as for delivering a printable block direct from a statue or other picture, by direct photography (which is about the same thing in effect as reproducing a photograph), is really not a half-tone process at all, as it yields by impression only absolutely black points with absolutely white spaces between them. This of course presumes that the ink is black and the paper white. The process is limited by the capabilities of the present presses for printing relief-blocks, but those are the presses on which all cheap printing must be done in these days; and the process must be made to suit the presses long before press-manufacturers are able to deliver machines that will give real half-tones with existing blocks. "Underlaying" and "overlaying," which were so effective in the days of wood-engraving, and are so

yet, where this is used, give wonderful mass effects; however, they help but little with the so-called half-tone blocks, because an effect cannot be produced from a thing which does not exist, and the "lights" on a half-tone block are represented by spaces only. If there were really half depths, they could be made to take less color than the parts of full height, and more than those of full depth; but the aim in making such blocks is to get all heights alike, or all depths alike — which is after all the same thing.

The light-print has made itself by its own intrinsic and unmistakable merits indispensable to the machine-builder and the architect and builder, while the real-estate agent does not despise it. But up to date the blue print is the favorite, not because it is blue, and because its lines are white, but in spite thereof. There are brown prints and blue prints each with white lines and the other way about; but as a rule they require two, if not three, baths, are dirty to make, and require more time and skill than are always available.

To make a photographic print with the sharpness of the familiar blue print, and with the same quickness and ease, but black instead of blue, has been made the aim of photographers for some time. You try.

If whoever invents a process for photographing in colors reaps a reward commensurate with its importance and the eagerness with which it will be welcomed by the public, he will be a very rich man.

A good photographic bath for simultaneous de-

veloping and fixing positives has not yet been invented. Such a bath would be desirable only on condition that the pictures produced thereby should be permanent and not bleach out, as is the case with the majority of the compounds now offered for the purpose.

Chapter XXVIII.

AGRICULTURAL

Those who have seen the slow process by which sugar-cane is cut — in Cuba by the ever handy machete, in India by the curved *kukri* sharpened on the concave edge, and in every land where sugar-cane is grown, by some particular form of knife, but always by a knife, always by hand — will perhaps wonder why there is no mowing-machine for cane. Probably it is because "what is everybody's business is nobody's business." Be that as it may, there should be a sugar-cane mowing-machine, and there is not. It is not to be imagined that any one can get this up who has not seen the cane growing, and been on the spot at the season of cutting; but there are hundreds of ingenious men among such as live in the cane district, or get there from time to time, at the proper season, and the reward of success would make it worth while for them to go in vigorously and attack the problem.

The districts in Germany, England, and America where hops are grown receive each year in the picking-season an invasion of the unemployed from other districts where there is little to do at that particular season. They are not always the very best class of workmen, and the influx usually leaves behind it a demoralizing effect; but often there is a

lack of even such labor, so that the condition of the hop-grower is similar to that of the Scotchman who said of the porridge that it was "cold, sour, burnt, and gritty, and, damn it, there is n't enough of it!"

There is more money in a good cotton-picker than there has been in Eli Whitney's cotton-gin, and that is saying a good deal.

Ties for cotton-bales cost too much money. Some other way of fastening the bales is needed; and whoever gets it should name his own price for it.

Milking seems so easy! It is not. And there are individuals who can milk only some particular cows. The attempt to substitute machines for dairy-maids and their trousered fellow workers has been a very expensive failure for many inventors. But the prize is worth the labor and the risk. One of the peculiarities of the task is that the cows which have been hand-milked miss the person and simply refuse to give down their milk to an air-pump or a suction-hose. If, however, there were good machines, they could be used at first only on animals which had never been hand-milked; and if these latter objected later to hand-milking, it would not make so much difference.

The success of the incubator for prematurely born and for other very weak infants shows what can be done when a problem is scientifically attacked and success is absolutely necessary. There are many good incubators for poultry, but they all lack something, because they have not been properly approached, and have usually not been worked out

by proper combinations of experienced poultry-raisers and competent mechanics or scientists. The best use to make of a scientist is to get him to produce something that it will not require another scientist to use. Our Agricultural Department at Washington is a good instance of the proper combination of practice with theory; and by "theory" I do not by any means intend to convey the idea usually falsely connected with properly directed, consistent technical work, applied to suitable material.

Millions of dollars are lost irrevocably every year in America alone by the ravages of caterpillars, moths, and other parasites. This is an example of the strength of numbers. There is a limit to what human hands can do; there is one to the number of such pests that a ring of tar can stop. The writer has seen in one German pine forest hundreds of acres that were rendered absolutely worthless, except perhaps for mine timbering and fire-wood, because for a space of about ten years a certain caterpillar had been quietly sapping the life of the trees. Prevention would have saved them; cure there was none. The same thing has happened in Massachusetts and in other parts of America. The country would owe a debt of gratitude to him who would invent or discover some way of combating these pests, whether by a mixture to spray on the trees, a compound to smear on the trunks, a solution with which to saturate the earth, or another animal parasite to prey on the first. Only be it remembered

that the English sparrows that were imported to kill off the caterpillars in Central Park, New York, proved almost as big a nuisance as the caterpillars, for they drove out all our native song-birds, and eventually even the squirrels, that had so long made the Park their home.

The writer recollects as a boy, living in the little State of Delaware, one district where there were 225,000 peach-trees growing in one neighborhood. Of these, 35,000 belonged to one family. There are times when the trees overbear, and then the peaches are not so good as usual; and by reason of the greater quantity and inferior quality — to say nothing of the lack of transportation facilities which often manifests itself — the full or extra heavy crop does not bring so much as the average crop. What pays best of all is a third or a half crop. Now if there could be a machine by which one third or one half of the blossoms could be destroyed, it would prevent the glut on the market, and the peach-growers would be very willing to pay liberally therefor.

Chapter XXIX.

FLOUR-MILLING*

In wheat-milling there are two principal sources of discoloration of the flour. First, there is a mechanical discoloration, caused by the presence of minute particles of crease-dust, "beard," and bran; and second, a natural yellowish color of the starch in the wheat-berry, aided by the yellow, fatty germ — which latter, while very nourishing, or at least fattening, has a tendency to cause souring if the flour is not properly kept. For the first of these troubles the remedy is purely mechanical, and must be applied early in the milling-processes: (1) more brushing for the crease-dirt and the beard, and (2) better handling of the bran — that is, it should be kept flat and in as large flakes as possible. If properly cleaned, it has about the same appearance on both sides, instead of being white on the inside, as by old process or "low" milling. Well-cleaned bran has no more nourishment or flavor than so much cocoanut fiber. For the yellowish color, unscrupulous millers use alum and other "trade secrets." Something better is needed.

The introduction of "roller"-milling does not seem to have materially diminished the demand for

*See also the chapter "Inventions for which Prizes Are Offered."

good millstones. As the quarries of La Ferte'-sous-Jouarre and elsewhere are being exhausted, and as in any case the natural stone comes in small pieces which must be dressed to shape and hooped together to form a millstone, the need of a substitute is apparent. The new material must be hard enough to stand wear — not merely as a matter of economy, but to prevent particles of grit getting in the flour; must be susceptible of being dressed into flats and furrows, without spalling out; and must be slightly porous, to give thousands of cutting-edges to catch and sever the grain. The lighter in weight the better; and all the pores must be approximately of the same size. One of the great faults of the natural stone is that it contains large cavities which have to be filled with a cement — usually of magnesium chloride, although unscrupulous millers often use lead or its equivalent, which gets in the flour and causes poisoning.

No one yet has been able to bale bran. Whoever succeeds in doing with this material what is now being done with cotton will find himself able to dictate terms to capitalists. This is one of the things that are called for — not seldom, but often; not faintly, but loudly; not by outsiders, but by those who could use the machine.

Chapter XXX.

HOUSEKEEPING APPLIANCES

Housekeepers often call for a preserving-can of tinned iron or its equivalent, as glass, while having the advantages of being easily cleaned for further use, breaks too readily when subjected to the temperature of the newly heated fruit, etc.; and further, the action of the light affects the color of some preserves and the flavor of others. Glass is also rather heavier than tin would be. The air-tight cover must be in fact what its name implies. Such a can would enable housewives in the country to preserve their surplus fruit and send it to market, where glass would cost too much for the necessary packing and extra freight both ways. If I had another suggestion to make it would be that the cans themselves should be conical, so as to enable the "empties" to be shipped in small space.

Is there only one firm in the entire world that can make automatic spring rollers for window-shades? It would seem as though Spencer Hartshorne had enjoyed this most profitable monopoly too long.

There are some circumstances under which the Recording Angel (I have forgotten his name, but that is immaterial) would excuse a few of what Mrs. Malaprop or Mrs. Partington would call "cursory remarks." One of these circumstances is where

carpet-nails come into question. Years ago we were satisfied with carpet-tacks which were simply the "common or garden" cut tack, supplied with a small leather washer. And very good little fellows they were too, if not exactly handsome. Nowadays we have "carpet-nails," which possess all the bad qualities of the average drafting-tack multiplied in exact ration to the increased size. The weak point in more senses than one is the place where the pin joins the head. Here they either bend, or break off short. He or she is lucky who can use one of these abominations more than once. Here low price has been made of undue importance; everything else has been sacrificed to cheapness. Inventors to the rescue.

The late J. Eastbourne Mitchell, so well and favorably known in Philadelphia as "Grindstone Mitchell," always asserted that there was nothing like natural grindstone for sharpening carpet-tack dies. It would appear that housekeepers thought there was nothing but natural grindstone which would sharpen table-knives. It remains for inventors and manufacturers of emery-wheel grinding machines (which does not mean machines for grinding emery-wheels, Mr. Hypercritic) to produce a light, high-speed machine for household use, so simple that the average servant could not get it out of order, and so arranged that it would give the knives the proper edge, whether or not the workman or workwoman was "skilled in the art," as the patent applications read. The old-fashioned grindstone

is too slow and rough, but there is little better offered for domestic purposes.

Some housekeepers, and many, many keepers of hotels and restaurants and the like, call for a simple, light, bread-cutting machine, on which the thickness of the cut might be regulated, and the knife of which could readily be taken out and sharpened on an ordinary household wheel. This last clause bars out all knives with curved blades, intended to give a draw-cut. The draw-cut is an essential, but manufacturers of paper-cutting machines find that straight blades are exactly right for their difficult work, and this should be the case with bread, also.

There are in the household many little losses which evoke anger; one of them is the breakage of eggs. A simple egg-chest is one of the things which are often enough called for to make it worth the inventor's while (the author does not know what a "while" is, but that is the usual phrase) to get up, and place on the market.

Since the author called for a device by which eggs could be cooked on the breakfast-table any desired length of time and the lamp then automatically extinguished, a German dealer in household articles informs him that he has one in preparation; but from his description the author is awaiting at this writing a complicated and expensive arrangement. There is room for half a dozen ways of accomplishing the result, which of itself is unpatentable.

There are many housewives of the old school who

lament the disappearance of the copper kitchen utensils of their youth, such as are still seen in French kitchens and on board ship. While admitting that they are picturesque, that liquid will boil in them more rapidly than in enamelled ware, and that they have the good quality that one always knows whether or not they are spotlessly clean, the author has had the bad luck to have been poisoned in Germany by eating marmalade cooked in one of the much lauded "coppers," and has no desire to repeat the experience. He would therefore suggest as an alternative a cheaply made utensil of sheet steel, plated with copper and then tinned inside — and perhaps also outside. The invention would consist in the process of producing these cheaply.

Machines for sewing on buttons seem to be just a little beyond our reach so far. When they come, if they do the work properly, rapidly, and cheaply, they should be a pecuniary success.

It is about time now for some one to get ready to produce a household filter for drinking-water — something that will not clog up, that is easily cleansed or renewed, and will have capacity for rapid passage of the water.

Another thing that is much wanted in the world is a floor-scrubbing machine. Invent one! If you do not, somebody else surely will, and then you will be sorry. Think what a boon such a contrivance would be to overworked housewives, and give your brain an extra hard day's work. The machine must use soap and water or its equivalent and wipe the

floor dry after cleaning it; furthermore, the dirty water must not be returned to the receptacle for clean.

How about a substitute for carpet — just a floor-covering that will serve the same purpose at less cost? You can be a multi-millionaire before the year is out if you can solve that little problem. Look what the Linoleum people have made and still are making!

Sewing-machine manufacturers and housewives would unite in welcoming an invention by means of which the ordinary household sewing-machine would be able to use thread from the wooden spools on which it is bought in the stores, instead of having to be respooled on small steel bobbins — a process that consumes too much time, especially in "straight seaming" at high speed, where the bobbin-winding takes comparatively too much time.

Perhaps you can contrive a simple and inexpensive tool that will cut ice without wasting it, taking the place of the wretched and extravagant ice-pick now in use. Why not try, any way? There should be about it somewhere, one would think, the principle of the saw; and it must be made with due reference to the fact that while ice is easily split in a direction at right angles to the upper surface of the cake as it lies on the water on which it is frozen, it is extremely difficult to split in any other direction. In this particular it is to be treated like a block of "end wood."

After all, it is not always so very hard to get rich.

Fortunes offer themselves on every hand as rewards for a little ingenuity. For example, a machine is wanted that will open oysters. If you can make one that will do the work satisfactorily, it will render you independent for life.

Most people, especially women, cannot sharpen their own knives. They need some little machine that will enable them to get over the difficulty. Why not make one, and patent it? First, however, figure out what is needed and what is not needed; then inquire what has been offered on the market to supply the need; then, having analyzed these and found out their good and their weak points, work out your own ideas so as to "cover the ground."

Chapter XXXI.

IN MUSICAL LINES

Even musicians, who resent the idea of having anything in common with "practical" people, and condemn all piano-playing apparatus (unless paid large sums to sign laudatory testimonials about them), have their wishes which they desire to make known to the inventive class. They want, in the first place, a machine which will give the fingers a limbering-up, such as would otherwise have to be accomplished by practising for four or five times as long. This would be a sort of Swedish movement exercise, accomplishing the desired flexion of the muscles and increased circulation of the blood, with consequent increase in the muscular strength, which would otherwise call for considerable expenditure of nerve force. Their neighbors would no doubt welcome anything that would give relief from so much practising. It should not, however, be one that would be likely to ruin the hand, as was unfortunately the case with one invented by Schumann in his early days, which by crippling his right hand prevented his ever playing again.

A second invention which piano-players and other performers call for is a device for turning over the pages of sheet music. Some have been produced, but they are not capable of handling sheets of differ-

erent thicknesses and qualities of paper without special adjustment for each sort; and some of them demanded more work to make them turn the page than would have been necessary to do the work of page-turning itself. Again, some of them would not readily stand on many makes of piano; and as there is such a variety of racks, this would cut them out from general use.

Musical composers have long sought an apparatus which would register their impromptu compositions or their tentative studies — not as a phonograph or gramophone would do it, but in characters which could be transcribed into the ordinary notation, if not in the regular notes familiar to every one. There is many a musical gem lost to the world because the composer who had evolved it, by a happy touch, could not later remember just what the combination that produced the admired result was.

There are many more persons who love music, and understand it, but who cannot play any instrument, than there are good performers. (I might go further and say that there are many who play constantly and play so badly, without knowing it, that their playing should be forbidden by municipal ordinance.) The great majority of really musical non-performers would be blessed by a half-automatic attachment to the piano, by which the merely technical part of playing could be attended to by the attachment, while the "semi-performer" could give such expression or interpretation as seemed to him best. For Germany and Austria it would be well to

have such an instrument or attachment for the zither, as well as one for the pianoforte.

In the many kinds of automatic musical instruments with Greek names there is one nuisance in common: the difficulty of changing the perforated plates or strips which determine the air to be performed. They are frequently damaged in putting them in or taking them out or while they are put away. It would be very much better if they could be kept always in the instrument and changed in the same manner as the shift of a barrel-organ cylinder is accomplished — by merely pushing in or pulling out a stop.

Chapter XXXII.

MISCELLANEOUS

Most of the fire-hose made of seamless canvas has the great fault that if lined with India rubber the inner portion does not remain fast on the canvas, but comes loose in blisters, which diminishes the capacity of the hose. The writer has seen the entire hose stopped at a fire by a long section of lining getting loose and completely clogging the passage of water.

Four-ply hose, on the contrary, made of alternate layers of muslin and rubber, or rather of four plies of muslin coated with rubber, has either one fault or another, both producing the same evil result. Almost without exception, such "plied" hose either expands or contracts in length under the internal pressure of the water. Usually it contracts. If it shortens when pressure is applied, it has a tendency to pull from the ladder the fireman who has carried the line up and then calls for water. If he hooks it to the ladder, there is danger of pulling this with it. If, on the contrary, it lengthens under pressure, then when the water is purposely shut off, or in case a section bursts, the shortening takes place, with the same dangerous result. There is a chance for some one to get up a hose which will neither contract nor expand in length when under pressure;

also to produce a seamless tubular canvas hose that will be water-tight under four hundred pounds pressure to the square inch, and not be liable to come apart in service.

The street letter-box locks in most countries can be very readily picked. A much better arrangement than the present key-lock would be a combination time and key lock, which could be adjusted by the collector, so that it could be opened even by the proper key only at such time as was predetermined at the last collection. This would prevent the use of false keys or of pick-locks at such times as the boxes are not under the observation of passers-by; and would even prevent thieves in carriers' uniform and provided with false keys relieving the boxes of their contents shortly before the regular collection-time.

The ordinary lettering-brush used in marking boxes and bales, without the use of a stencil, does not give so good results as might be desired, as much time is lost in dipping it in the paint or ink. If a fountain-pen is good for writing on paper, why would not a fountain-brush be good for this lettering-work, which, after all, is only writing on a large scale?

Much is said concerning the dangers of automobile sport, but when one dips into statistics and looks under the head of "Runaway Horses," one is confronted by the fact that they are even a greater source of accident to life and limb than are the automobiles. A method of preventing such accidents,

either to the occupants of the vehicle or to those in the street or road, has been long called for; and there are many patents on the subject; but as yet there seems to be no abatement of the evil. Electricity and all sorts of things have been tried, but most of the devices have been either too complicated or simply ineffective. The writer, having been very badly smashed up in such an accident, can see just where the invention would be useful. Accident-insurance companies would be apt to recommend a good one to their policy-holders.

Is flexible glass too chimerical for American inventive genius?

The practical utilization of peat has only begun. This material, so universally distributed all over the world, has a great future. The principal difficulty in making use of it is in getting rid of the immense quantity of water which it contains, and making it into blocks or plates without having to use either very heavy and costly machinery, or expensive "bond," or both.

Plants for the carbonization of peat have been called for again and agian, but are not offered for sale. Two distinct sizes are demanded: one with an immense capacity, for very large plants, and another quite small one for what might almost be called domestic use. A medium size would hardly be called for until the industry got fairly on its feet.

Every year millions of tons of sawdust go to waste. In some of our saw-mill districts "crematories" are

built, in which to burn it, as letting it go into the streams is apt to kill fish and clog the turbines. There is material and to spare; what can inventors make thereof? Briket fuel, flat slabs for flooring, and blocks for street-paving — all these would use up a material which now goes to waste; but there is needed a suitable "bond" and proper machinery to make the thing commercially possible.

The biograph or bioscope apparatus now before the public seem to have in common one great fault, — that they give trembling pictures. The reason for this is that the pictures are taken on a constantly moving strip of gelatine, while the exposures are consecutive although their duration is but short. The result is that all the pictures are slightly oval, and that they do not join on the screen. If the camera apparatus were to make allowance for the opening and closing of the shutter by halting the film when the shutter was open, and only then, this trembling would in great part disappear.

There are folding opera-glasses which fold all right enough, but are in the habit of shutting up at the most interesting moment of their use; further, they are extremely inconvenient to hold. Who will make better ones?

There is no good instrument for measuring the velocity of the wind or of a current of air. A good one could be used not only in scientific observations, but in the industrial arts.

The pyrometers which are on the market give at best but crude guesses at the temperatures which

they are supposed to indicate. A good one would pay, if simple and reliable.

Inventors of a surgical turn of mind might find it profitable to devote their attention to producing a good appliance for holding the patella or knee-cap when it is fractured. At present it is practically impossible in nearly every case.

There are on the market water-tight watch-cases, but they are screwed together, and a very slight injury makes it impossible to unscrew them; while sometimes, even under normal conditions, opening them is difficult. An air-tight case would exclude both moisture and the fine dust that comes from the cloth of the pocket, and from the surrounding air. Such a case would prolong the life of a watch and increase the accuracy of its time-keeping.

There are few toothbrushes, even of the best sort, in which the bristles are so well fastened in that after a brush has been in use for some little time they will not pull out in use — which is not only expensive, but highly unpleasant, and has sometimes led to choking.

Barbers call for apparatus for disinfecting razors at the time of stropping them. The entire range of barber's implements should have cheap and effective means of disinfection. Even the reputed richest man in the world has been the victim of a skin-disease, caught at a barber's, and has thereby lost all his hair and beard.

A foaming beverage free from alcohol, and having a pleasant taste and no cathartic or other undesir-

able effect on the digestive tract, so that it could take the place of beer, would sell well. Even if it contained as high as one per cent of alcohol, it would not matter much, as no one could hold enough thereof to become intoxicated thereby.

Bones, intestines, and other animal offal could be very well used as food for dogs, if some one would invent a sort of meat-cake made therefrom (like the present so well-known dog-biscuit) which would keep in any climate and temperature.

A process for removing the deposit from the bottoms of old port-wine bottles would be well received.

A fortune awaits the man who will invent a satisfactory hairpin — a pin, that is to say, which will really hold the hair in place and not "come loose." Hundreds of patents have been granted for as many different patterns of hairpins, but not one of them meets this requirement. The weekly consumption of hairpins reaches far into the millions. The new invention must go in easily, only come out when the wearer desires, and must not split or tear the hair.

There are on the market two kinds of self-threading needles,— that is, such as do not require the end of the thread to be carefully steered through the eye, — but neither of them can be used with silk. So those who know say.

Thousands and thousands of smokers have longed for a convenient cigar-lighter to dispense with matches. "The last match always goes out" when one is fishing from a boat, or is in some other situation where more matches cannot be obtained.

How many million cigar-holders are used each year? And how many hold the cigar firmly? This is principally because there are so many different forms and sizes of cigar-tips; but holding these is just the problem.

An air-tight metal capsule covering for beer and mineral-water bottles would be readily made profitable, if light, cheap, and reliable.

Umbrella-makers tell the author that they would like to hear of a good process by which umbrella-sticks with right-angled "grips" could be made, by bending or otherwise, more cheaply than at present, and without splitting the wood by reason of the different curvature of the inner and the outer sides of the bend.

The development of the ordinary skate—since, let us say, 1850—has not been so rapid as would have been the case if inventors had had their attention attracted thereto. We have, however, at any rate got beyond the stage when we believed that it was absolutely necessary for the runner to be grooved (many a time has the author stayed off the ice because his skates were not "guttered"), and the time is long since past when there was a wooden sole with a screw which was driven into the boot-heel, or a stud fitting in a plate in the latter. With these times are gone the days of feet so tightly strapped up that they become absolutely insensible. But still, for all the conveniences in clamping the modern steel-soled skate to the boot, there is much left for the inventor to do to accommodate the skate to

different heights and shapes of boot-heels, and to perfect other details.

Cremation would be more rapidly introduced if there were a little more science and a little more common sense in the furnaces which have been proposed and tried for effecting it. A man may be willing to risk spoiling the making of a batch of steel by an imperfectly made furnace, but no one wishes to try — even upon his mother-in-law — an imperfectly working crematory.

The man or the woman who will get up something better than the present high hat in the way of dress attire for the sterner sex will deserve well of his or her countrymen. The civilized world — or at least the European and North American parts thereof — is under the bondage of the high silk hat. It is hideous, uncomfortable, and dear; and requires constant ironing and daily or even more frequent "slicking." It is perhaps too much to expect that a substitute will be produced which will drive it out to follow the crinoline.

Our modern foot-gear is highly injurious to the feet, because it is unventilated; and until this ventilation is accomplished our feet will be tender. The use of india-rubber overshoes increases the evil.

To get down to an article for every-day use by every one — there is no good newspaper-holder. There is a great variety, but not an "elegant sufficiency," because they do not suffice. As a proof of this statement, try to eat your breakfast and read your newspaper at the same time. And then essay

taking the paper from the "file" and replacing it. Those holders that can be held are unpracticable as regards ease and security of filling; and the ones that can be readily filled, and which stay filled, cannot be held in one hand at the breakfast-table.

Any one who has ever lamented the miserable method of case-binding in vogue will confirm the statement that there is room for a better system, which will permit books to be opened out flat like an Oxford Bible and allow the entire page to be laid open to view. It must, of course, be as cheap as the present system.

An envelope that cannot be opened without detection is yet to be invented. Can you not solve the problem? As Colonel Sellers used to say, "There 's millions in it."

Speaking of envelopes, what is the matter with devising one that is suitable for carrying small articles through the mails? Nothing really good of the kind exists at present. Will you not step into the breach and, while covering yourself with glory, fill your pockets with money? First, however, inquire what is already on the market, and what the post-office authorities specify as prerequisites.

All the foregoing are possible things to produce. There are many things for which we would all devoutly pray if we thought they could be produced; as, for instance, an automatic jainitor who would not steal coal and would not read our papers in the morning before sending them up; a self-acting mechanical barber who would not eat onions or garlic

and would not smoke bad cigars nor tell you how sick he was the day before. These are consummations devoutly to be wished, but there is little or no hope that they will ever appear.

A sensitive cornet which would blow the player so full of flour, if he played falsely, that he could not play again for a week would be a great boon to a suffering community; as would a machine which would pick the bones out of shad.

I have enumerated many lines which offer substantial reward for practical inventive skill; but have not named them all, nor nearly all. Space would not permit this. Those who are interested in such subjects and are on the alert for "tips" concerning good directions in which to apply their talents should keep their eyes and ears open and their mouths shut.

Chapter XXXIII.

INVENTIONS FOR WHICH PRIZES ARE OFFERED

The management of the Milan International Exposition was empowered by the "Associazione degli Industriali d'Italia per prevenire glè Infortuni del Lavoro" to offer the following:

(1) A gold medal and 8,000 lire (about $1,600) for a new system of preventing the dangers arising from contact of high-tension with low-tension electric conductors, as in "step-down" transformers of the alternate current.

(2) A gold medal and 1,000 lire (say $200) for a crane or other hoisting-device with a simple and practical arrangement by which to prevent the load from running down the crank, if the latter be left free, as in lowering.

(3) A gold medal and 500 lire (say $100) for a simple, strong, and reliable safety device to hold a mine-wagon on a slope, if the cable breaks.

(4) A gold medal for an invention for exhausting and collecting the dust arising from sorting and cutting up rags, as in paper-mills. The device must not create a draft.

(5) A gold medal for a device which will remove and collect the dust arising from carding flax, hemp, jute, etc.

(6) A gold medal for an arrangement by which to prevent the spread of dust in rooms where lime and cement are handled.

The address of the Secretary of the society above named is: Foro Bonaparte, 61, Milano, Italy.

The Paris daily journal *Le Matin* offered a prize of 10,000 francs (about $2,000) for a method of destroying flies, which are said to be the means of propagating cholera. [This may be the fact, but the author thinks that flies do a great deal of good by consuming decaying and other matter which might otherwise cause disease; and that the best way to avoid cholera is to keep everything absolutely clean, and to eat or drink nothing uncooked.]

A prize of 100,000 francs (about $20,000) was offered by the heirs of the Washington patent lawyer Pollak, who was lost on the *Bourgogne* for the following inventions:

For preventing collisions at sea; for saving the ship, in case a collision occurs; for saving the passengers, in case the ship goes down.

Prizes of from 2,000 up to 5,000 marks are offered by the German War Department for the best design for portable field-kitchens. These must be light, yet strongly built, arranged to be drawn, with their entire contents, by one horse, on soft ground, and must be able to follow the troops over uneven country. The gage is fixed at 1,553 millimeters, or 61 inches; the kettle must hold 150 liters, or practically 40 United States gallons. The cooking-arrangements must be such that the kitchen can be

used for preparing meals while in movement, so that a halt for this purpose need not be necessary. The fireplace must be suited to all kinds of fuel indifferently — wood, coal, peat, straw, etc. Designs in competition are to be sent in to the Train Depot of the Garde Korps, Tempelhof, Berlin, by the fifteenth of February, 1906.

The German Society of Railway Managers (Verein Deutscher Eisenbahnverwaltungen) offers every four years prizes of 30,000 marks (about $7,150) for important inventions and improvements in railway lines. These prizes are as follows:

(1) For improvements and inventions in the line of constructive and mechanical devices for railways and their operation, a first prize of 7,500 marks, a second of 3,000, and a third of 1,500.

(2) For inventions and improvements concerning the construction and operation of the engines and rolling-stock, prizes of 7,500, 3,000, and 1,500 marks respectively.

(3) For inventions and improvements concerning railway management, direction, and statistics; and

(4) For remarkable literary work concerning railways — for 3 and 4 together, one first prize of 3,000 marks and two of 1,500 each.

Without limiting the competition to other railway topics, and without binding the Committee of Awards, the following subjects are suggested by the society as well worth working up:

(*a*) Mechanical locomotive-stoking.

(*b*) Improvements in steam-heating trains, particularly long ones.

(*c*) Air-brake hose-couplings, by which the shut-off cocks could be dispensed with without affecting the automatic action of the brakes.

(*d*) Devices for facilitating communication between the members of the train crew, especially for long passenger and freight trains, and for freight trains without continuous brakes; also in tunnels.

(*e*) A critical discussion of the question of motor-cars, and that of hauling light trains by these or by locomotives, from the technical and the financial standpoints.

(*f*) Simplification of the operations in distributing the traffic and charging up proportional freight rates.

The German Society of Mechanical Engineers (Verein Deutscher Maschineningenieure; not to be confused with the Verein Deutscher Ingenieure) has offered prizes for studies concerning increase in the capacity of the Berlin elevated roads and connections (Berliner Stadtund Ringbahn).

(1) As to whether the capacity of the road and its connections could be increased by using two-story cars approached from two-story platforms. The trains are to be electrically driven by single-phase alternating currents; the studies should embrace the electric appliances in and on the cars and the trolleys or other current-collecting devices.

(2) The track must be usable as before by the present locomotive-drawn trains.

(3) The passengers must be protected from injury, and the upper doors closed when the train is not at the platforms; starting must be impossible until all doors are bolted. [Whether this feature is desirable, without means of leaving the train in case of a breakdown or of getting out of the cars in case of derailment or fire, is, in the author's mind, a question; but that is what the society calls for.]

(4) There must be no confusion in seating, and no counter-currents of passengers in getting in and out. [As the platforms are sometimes on one side of the track, sometimes on the other, as with the Paris Underground Railway, the author thinks that this problem is hardly capable of solution without the aid of a sergeant and two corporals in each car, and placing the entire population, including strangers, under martial law, or at least military regulations.]

(5) Passengers must be protected against being crowded out of the cars, and stepping between car and platform or between two cars.

(6) The traffic is preferably to be directed to the lower story, hence the third-class compartments should be below. The question of cross-seats, etc., is to be considered.

(7) The matter of hinged doors and sliding doors is also to be considered.

(8) Swinging of the cars is to be reduced perhaps by lowering the floor of the under story. The question of sliding axles or pivoted trucks is to be weighed. American couplings are to be used. The heating

and lighting are to be electric; the brake, pneumatic.

(9) Papers on the subject are to be illustrated by sketches.

Details can be had by addressing the Society Verein Deutscher Maschineningenieure in Berlin.

Chapter XXXIV.

PERFECTING AND DEVELOPING

A few disinterested words about perfecting and developing inventions may not come amiss.

Perfect every invention before you try to patent it. By "perfect" I mean get it into practicable shape. Then you will not have to be constantly taking out new patents at the same expense as the original one; will arrive at a working result just as quickly; and will not be giving others the hint to work up the same line with yourself.

Patent your invention before putting it into practical operation on a large scale. It is all very well to have right on your side, but an interference suit is a very unpleasant thing to have. Where possible, see that your process or machine is all right in every way before you make your application for protection thereon. It may turn out not worth protecting; or it may be so valuable that it would be very bad policy to set any one else on the same hunt.

Put your invention in practice before you try to sell it. To some this may seem very like saying, "Don't get in the water until you can swim;" but what I mean is, make no serious attempts to interest capital for working your invention on a large scale before you have something tangible and practical to offer. It is all very well to interest some one

with you in the preliminaries to help you make your first instrument, and to get your invention patented; but when you come down to asking for money by the hundred thousand, or even by the ten thousand dollars, you had better have a better bait than an undeveloped invention.

In this connection let me caution you against showing imperfect models and sketches. Whenever you have anything to show to anybody else, anything to sell, see that you have a good sample, or a good bait. A model or a drawing for which you have to apologize, or which will fail you just when you want it to appear at its best, will not even draw money well for preliminaries; and as a bait for large capitalists, it is like a piece of watermelon-rind for trout.

Do not expect too much. It sounds well to say, "The higher you aim the further you shoot;" but there are some distances at which no one could hit anything. You might aim straight up in the air and not be able to hit the moon. Don't expect that millionaires are going to come around to your house evenings to interest themselves in your invention; or that they will drop their business and give you hour after hour, much less day after day, looking up what you have. Millionaires do not make their millions that way. If you get a presentable showing ready, understand it well, and are able to explain it promptly and without egotism or braggadocio, and to respond to all questions which may be put on the subject, you need have little trouble in get-

ting a large enough audience — always supposing that your idea is in a line where invention is needed, and that all other conditions are favorable. You must not expect patents to be any more salable, or salable under more adverse conditions, than merchandise.

Don't think that the whole country is lying awake of nights in the vain hope of having just such an invention as you have produced — or think that you have produced. The country at large, and manufacturers and others in particular, will probably welcome your invention as soon as you have shown (1) that it *is* an invention, (2) that it is in a line in which invention is needed, and (3) that it will work.

In getting it patented, avoid, as the devil does holy water, the "no patent, no pay" solicitors, and those who offer to get you full protection for about half the regular fee. The first are like quack doctors; the second, like shoddy dealers. Get your patent through reputable solicitors, who will charge a good, living price and give you something through which the next comer cannot drive a circus wagon, band and all.

Avoid shark patent-selling agents, particularly the kind who charge you for examining and advertising. Very few firms which sell patents will insist on such a fee. It is of course desirable that any one undertaking to sell a patent shall have, before he undertakes it, some idea of two things: first, that it is a good thing; and second, that the patent papers are well drawn. But there are many cases where

the inventor can show the agent, more plainly than he could find out for himself, that the invention is a good one; and the name of the firm which has procured the patent papers should be the guarantee that they are well drawn. There are of course exceptions to most rules, and there are to this. But whether you pay an advance fee or not, see that the firm to which you offer the negotiation of your patent is well connected and recommended, and has already successfully done business on a cash basis for other inventors.

Avoid, on the one hand, too great haste in getting rid of your invention; but, on the other, too great delay. Do not let the sense of the importance of your invention keep it on your hands for three or four years after patenting. Remember that a patent, unlike real-estate, never gets more valuable with years.

Before you spend much money — either your own or any one's else — be sure: (1) that your invention will work; (2) that no one else has patented it; (3) that there is an opportunity for its sale; (4) that there is not too much competition.

Many a man starts off and orders a fancy nickel-plated model, and applies for his patent, only to find that the idea will not work even the least little bit. In this matter the advice of some one well up in the theory, added to that of some one else well up in the practice, would be valuable.

Many an application done up in all the bravery of typewriting, notarial seal, and all that, has been rejected like a bad penny for the very simple reason

that some one else had before patented the idea, or something enough like it to bar out the newcomer. It is cheaper to have the ground gone over first by a preliminary search made by a competent person even before the application is written out.

There are many good things which are very ingenious, and perfectly novel and patentable, but which are in lines in which there would not be enough sale in ten years to pay the inventor the expense of getting out patents. Yet plenty of such things are patented almost every week, in this country. Sometimes there could be but one customer,—say the Government, or some great corporation,—and there may be reasons which are obvious, and others not so plain on the surface, why you could not even make them a present of your invention.

There are some lines in which competition is so fierce that there would not be any use in coming into the field. If the Marquis of Worcester, Watt, Fulton and Morse, Whitney and Howe, Edison and McCormick, and a dozen more of the great inventors of the world, past and present, were to put their heads together, and get up a new car-coupler, the chances are that they could not get thirty cents for the patent. The thing is overdone.

You must bear some of the burden of the introduction yourself. A capitalist may be willing to bet his hard dollars that your idea will work, if you have secured a patent; or he may be induced to bet that it is patentable, if you show him that it will work; but moneyed men who will bet that your in-

vention is both patentable and practicable are few and far between. If they make such a bet, it will be with very heavy odds against the inventor.

Don't be unduly suspicious. Don't fear that any one who takes more than a passing interest in your invention is going to steal it. All business is based more or less on trust. You trust some one every day. So does every one else. There is no use in your showing every Tom, Dick, and Harry what you have, or expect to have; but if you show a man anything at all, do it with trust. If he is not trustworthy, do not show him or tell him anything.

Don't take out a caveat. To do that simply offers a premium on some one letting you have the luxury of an interference suit. You pay ten dollars government fee for a caveat, and your paper is filed. If some one else puts in a patent application which interferes with your caveat, and the clerk who filed your caveat happens to remember your idea, you are then notified that it is your special privilege to defend your property.

Fight shy of patent-selling bureaus, the proprietors of which profess to be "very near" this, that, and the other great head of a corporation, or of a government department. Any man who has a good thing to sell, and is of business habits and good address, could get near enough to any one who wants to know of new and good things to be able to show what he has, and for the person addressed to be able to reject it if it is not good. Men with a "pull" are, as a general thing, to be avoided, particularly if they

brag thereof. There are of course men who have a pull; they have it because they deserve it. But all the pulls in the world would not pull invention from the slough of worthlessness to the high ground of merit; and men who have a really good pull with really great men are not going to risk spoiling their pull by showing them poor things; and as a general thing the men with a pull are harder to get at than the people with whom they have the pull.

In most cases the best way for the inventor is to license others to use his patent, paying either so much per thousand articles made, or so much for the right to make in a certain State, or so much for the right to apply the invention to certain things. Thus, for an invention in the line of machine-made shoes, so much per thousand pairs; for a driving-wheel or something that once applied cannot be moved, so much per State or per county (based on the population); for a compound like celluloid, so much for the right to make combs, so much for the right to make collars and cuffs, etc.

What patents are worth is a question often asked; but there is no answering it. The inventor very seldom places his estimate too low. Some men have made millions out of a single patent; others have lost all that they could make and borrow. There has been about as much made in some lines, on royalties paid by infringers, as by the inventor himself — sometimes more. An invention in the hands of some men might realize a hundred thousand dollars' profit; worked by others, not one thousand.

No one can look upon a block of land and say how much could be made out of it by a skilful real-estate boomer. The range in values of patents is even greater than in those of land. The patent on an invention which is based upon one owned by some one else might not be worth the match that it would take to set it on fire. While, of course, those who have inventions of their own are glad to have them made as valuable as possible, there are instances where a thing already patented is so good, and has cost so much to get it on the market, that the maker does not want to bother with any improvements. If a thing is twice as good as its rivals, and has the field to itself, to the extent of the maker's ability to manufacture it, there is very little inducement for him to get up new designs, patterns, and plans for the sake of making it a little better. The only time for him to do that is when his rivals have got somewhere near him.

There may be those who think that in these pages I discourage invention. I don't. But I think it criminal to encourage people who have poor things, or good things that would not be practicable to work up, in spending time and money in inventing and patenting.

There are very few inventions which can be well worked up and worked out without the aid of drawings; and too few inventors can make mechanical drawings, no matter how crude, which will show their ideas so well that they can be worked from by pattern-maker or other mechanic. Another thing

which is very important in this connection: it is very much easier to alter a thing on paper than in wood or metal. Proper mechanical drawings of most inventions can be made, and will reveal weaknesses or excellences which would not at first strike the mind. If you do make a drawing, be sure that it is sensible and practical; that is, that it truly — even if crudely — represents the object. A drawing which shows the front and two sides and part of the back of a machine or article is apt to be misleading — to be worse than none at all.

If you find that you cannot work out the details of what you want, call in outside help. There are plenty of wise heads engaged in just that business — criticizing and developing crude ideas. Where an inventor may not be exactly able to draw, or even to suggest, just what he wants, the professional adviser, or any other good, sound, practical man who is posted, may fill in the blank at once, or, what is of equal importance, prevent the adoption of something which would not work well, or at all.

Chapter XXXV.

SELLING PATENTS*

In undertaking to sell a patent for an inventor, the "promoter," or whatever other name may be given to the person who undertakes the task of turning the inventor's brains into money, often (and it may be said generally) encounters several obstacles which are, in fact, of such frequent occurrence as to be considered almost inseparable from such transactions. It might be interesting to recall some of the difficulties which are met, with a view perhaps to aiding some who have inventions which they wish to sell to place their invention upon the market.

In the first place, the most difficult thing to persuade an inventor is that an invention has little value of itself; that its value is what it may be made to produce by intelligent work at the right time, in the right place, by the right people, and among the right class of purchasers and users. There are few if any inventions which anybody is lying awake at night in the expectation of getting. People of the present day are very comfortable; very well satisfied with most things that they have. So it was with their fathers; so with their grandfathers before them. Nobody really needs anything. Nearly all of our actual

*Paper read before the Polytechnic Section of the American Institute, New York, May 24, 1888, by Robert Grimshaw, President.

wants and necessities are gratified. Our present wants are largely artificial; and while they are increasing, and while we are willing to pay for the gratification, we are not uncomfortable on account of the lack of any single invention as yet unproduced. Now if it be true of an invention that it has little value of itself, it is still more so of a patent, which is simply the title-deed to an idea, which title-deed may or may not be valid or valuable.

I hope that it will be pardoned me if I make the remark that the average inventor is so ingrained in conceit as to stand very much in his own light. He is bright and has individuality, although he may not possess originality; but that fact has no bearing whatever upon the value of his patent. The brilliancy, or popularity, or wealth of a man owning a house of which he wishes to dispose has no bearing whatever upon the selling-value of that property. All that the purchaser wishes to know is: whether the property has any value, whether that value is at least equal to the price demanded, and whether the title is clear and can be properly transferred in payment of the purchase money. But the inventor's conceit very often steps in between him and the buyer — at times with such offensiveness as to render the completion of negotiation absolutely impossible, if the purchaser has any self-respect, which is generally the case.

Another thing which very often comes up when an inventor is fixing a value upon his invention or upon his patent is that he generally claims to have

spent years of labor in the development and accomplishment of the idea. Now the purchaser does not care a *sou marqué* for that, any more than the purchaser of a house cares to know how many years it took the builder to save up money to erect it. It might have taken that inventor ten years to accomplish a certain result at which another would have arrived in ten months or even ten weeks. It may be the inventor's fault, or it may not, that the attainment of a result consumed a large amount of time or extended through a long period. But whether it is his fault or his misfortune has no bearing upon the market value of the invention. In fact, the statement that an invention has taken years of labor to accomplish might more truly be taken as indicating the inventor's incapacity, and the probability that if any improvement is desired it will take several years more to effect it, instead of its being producible upon short notice.

There is another thing which very often interferes with the sale of patents, and perhaps more so with realizing on those which come near to being demanded by the public than with any others. Those people who have the power to treat for the purchase of inventions in such lines have such frequent applications made to them by inventors more or less competent, having inventions more or less practicable, and secured by patents more or less valuable, that they are tired of being bored with offers of any kind of patent; and an invention has to be not only unusually good, but backed by considerable personal in-

fluence in order to secure even the most hasty consideration.

One of the first questions which is asked when the negotiation of a patent is commenced is generally, "Is the invention practical? Will it work? Will it keep on working? Will it save time? Or money? Or trouble? Or risk?" One more important query in this connection is as to practicability. "Has it been tried? If so, when? Where? By whom? And under what practical working conditions?" If the inventor has only the idea, or a little five-cent model, or perhaps only the ghost of the idea that he is going to have an invention, it is rather hard to induce any one to advance money upon this immaterial article of property. I think it was Oscar Wilde who referred most æsthetically to "unkissed kisses." One would imagine that they would have very little value; but they are just as valuable, and just as tangible, as the "unthought thought"— the thought which the inventor thinks that he is going to think, and thinks that no one else has thought before him. Some of these ideas (or ghosts of ideas) against which the inventor wishes the capitalist to plank down his hard dollars have about as much substance as a piece of wind tied up with a string; and the title-deed to such aërial property would probably be difficult to record, establish, or sell.

A propos of title-deeds, it must be remembered that a patent-paper is simply a record descriptive of the property, and certifying that the landmarks

and boundary-lines were established and laid down, and handed in to the Office of Record on a certain date, by a certain person who made the statement (based either on imagination or on strong presumption) that he was the discoverer or originator of the property to which the description and boundary-lines refer. The mere possession of a piece of paper issued by the United States Patent Office, and having a handsome title-page with a blue ribbon and a red seal, does not mean anything in particular. Patent Office officials and employees are fallible, like other men. Pieces of property worth millions of dollars have been taken away from those who have been in actual possession, by some one who has proved that their title-deeds were imperfect. If this is the case with realty which has always existed, and of which the certainty of title increases with age, how much more is it likely to be so with the title to only an idea! But as a general thing the inventor considers his possession of a little piece of paper with a red seal to place him beyond the possibility of any doubt, and objects to paying the expenses of having this title searched.

Another question which is most natural is, "Has the invention been perfected? Or is it still crude; and will it demand the delays and expenses of frequent and radical changes, and the issue of more patents upon these improvements?" The evolution of an idea is as interesting as that of man from the monkey. It often undergoes more changes. It very seldom emerges full blown from the inventor's

brain, and often the third or the fourth stage of evolution bears very much less resemblance to the original than man does to the primeval monkey from which he is said to have descended (although perhaps *ascended* may be the better word).

Another question which it is proper for the intending investor to ask is this: "Is the man who offers to sell the invention the owner? Is his title clear? Or has he mortgaged a quarter-interest to one person, one-eighth to another, and so on, for the purpose of raising money to develop it, so that there are against it either recorded or unrecorded claims which might make it difficult for the purchaser to do anything with it?"

Still another question: "Does the value of the invention covered by or referred to in the patent depend upon some other patent to which it is attached in improvement or perfection?" If this be so, it can readily be imagined that such a patent could have a value very much like that of a plot of ground entirely surrounded by other pieces of property through which the owner of the central plot has no right of way.

One of the very hardest things of which to persuade an inventor is that no one can afford to invest money in a "patent" which is not yet allowed. There are a great many reasons why (although the inventor may act in good faith) the issue might be absolutely impossible.

There are very many instances where the application, after having lain in the Patent Office for two or

three years, has been thrown out; and out of the whole number of applications made, not one-third is covered by papers issued.

The mere fact that there may be in the patent records nothing which in the judgment of the inventor, or in that of a competent title-searcher, may conflict with his idea, is no proof that there may not be something in every-day use that is unpatented, and which is in fact so old as to be absolutely unpatentable. Or there may be in the Patent Office something now in process of examination which may be identical with the idea towards the patenting of which the inventor wishes money to be advanced.

Again, as regards the issue of patents: the Patent Office may be "cranky." It may take a notion not to patent a certain idea; and whether that idea is reasonable or unreasonable has very little bearing on the subject; but the only way to compel the issue of such patent is a most tedious and expensive one.

One thing tending to lessen the value of a patent in its very earliest stages is that there may be very few customers for the idea, sometimes only one, as in the case of ordnance; and naturally the value of an idea which is only salable to two or three people is very much less than that of one which will suit millions direct.

Then, again, there may be in the market some other patented or unpatented thing that is just as good as the invention offered, if not better; or that may be just as good and very much cheaper; or that

may be controlled by the only person to whom the patent which is offered for sale may be salable.

A patent may be most excellent in itself, but the country may be already supplied with some other invention and it may be impossible to make a change. For instance: in the matter of continuous air-brakes for railway-trains — if you were to have a patent for a very much better invention than the existing one used on all the great trunk lines, you would find it perhaps difficult or perhaps impossible to introduce it on any one line; because the present continuous lines are already equipped with a particularly satisfactory system, and as all roads wishing to do business with connecting lines must be equipped similarly with those other lines, it will be found impossible to change on any one line without making the same change on all the others, which would involve throwing away the present appliances and replacing them with the new.

It is of the utmost importance for a patent to be properly taken out. The old saying that he who conducts his own case in court has a fool for a client applies with even greater force to the amateur patent solicitor. The chances are that such patent will have no value as a title-deed. It is curious enough that the man who would not dare prepare the title-deeds to a piece of property worth only $2,000 or $3,000 will attend to his own patent-soliciting in taking out the papers for an invention which he himself deems worth $40,000 or $50,000.

The inventor must bear in mind that no one is

going to be so interested in any patent as to go to more trouble and expense than he himself is willing to undergo to look into the matter under negotiation. The inventor must present the matter fully and freely; supply all necessary documents, models, drawings, specifications, testimonials, and statements; and must not expect an intending purchaser to put himself out — even to the expense of a postage-stamp — in order to find out anything about the invention offered for sale.

The suspicion which so frequently characterizes the inventor is a great bar to his progress. He too often considers that the whole world is leagued against him in order to prevent the introduction of his patent; or that whoever looks into it for the purpose of buying is merely endeavoring to get points from it, so as to enable him to steal the idea. As a matter of fact, the world outside cares very little one way or another about the inventor; he is to the world at large either a nonentity or a crank. The world at large cares neither for him, nor for his idea, nor for the patent thereon. It simply regards him as some one who intends to exploit the community for as large a sum as possible; and it expects to be bored concerning the invention; in some few cases individuals hope to receive profit in return for this boring, and for the money which they advance.

There is another thing which the inventor should write in capital letters in his mind: that apologies are no good. The invention must be ready to work. It must work on sight when shown. There is no use

in trying to make the purchaser believe that the industrial world will have to be reorganized in order to suit the imperfect work of a new invention. It must do work that people call for. The purchaser of an invention has enough to do to perfect and embody the thing mechanically and introduce it commercially, without undertaking missionary work, converting people in general to the inventor's theory as to what should be produced, or how it should be used.

A word of caution may be given even to the most suspicious inventor,— transact no business in reference to either taking out or selling patents, except with persons whose integrity is unquestionable. Having once found such persons, do not be suspicious of them.

For two reasons it is a bad plan to ask capitalists to advance money upon an invention for the purpose of patenting it. First, there is considerable risk in the matter — much more than the inventor thinks; second, such a course shows either poverty or lack of faith upon the inventor's part in his own invention. In either case he will get less for his patent than if he raises the money to perfect his title-deeds in another quarter than the one where he expects to sell the invention.

A word as to caveats. The United States Patent Office is in most respects very liberal to inventors, and extends a helping hand to them in every way, particularly in giving them six months between the allowing of a patent and its final formal issue; but

in the caveat it lays a trap into which many an inventor stumbles. A caveat is simply a piece of paper, for which the government fee is ten dollars, certifying that on a particular day the inventor lodged in the Patent Office a paper descriptive of his invention. If at some time after the issuing of the caveat and during the one year's period of so-called protection, some one else lodges in the Patent Office an application which conflicts with the subject of the caveat, and if the clerk who filed away the application furnished by the caveat happens to be still in the service and happens to remember that he filed away such an application, then the inventor is notified by the Government that he has the right to commence an interference suit — one of the most expensive things in which an inventor or his backers can indulge.

The first government fee upon the application for a patent is but five dollars more than that for the caveat, and gives the inventor a status and a record. There are very few caveats which have been issued that are worth the paper upon which they are printed.

Chapter XXXVI.

MUD-GUARDS FOR AUTOMOBILES

The average mud-guard on automobiles is intended to prevent the mud from splashing the occupants; but it does not protect the occupants of other vehicles which may be in the neighborhood, nor foot-passengers. Indeed, the motor-busses in London splash everything within a radius of ten feet, being in this respect by far worse than ordinary motor-carriages, which, in turn, by reason of their pneumatic rubber tires, are worse than horse-propelled vehicles.

Inventors should make a note of this fault, which is one of the reasons why the London County Council is refusing licenses to motor-busses — noise being the other and principal reason.

Chapter XXXVII.

INVENTION NEEDED BY THE FRENCH GOVERNMENT

Some years ago the French government offered a prize for a substance by which alcohol could be so denatured as to be absolutely undrinkable without being poisonous, and which should not materially increase the cost of the spirit. This prize has not yet been claimed, because there has been nothing offered which comes up to the requirements, which are, in detail, that it shall have a most characteristic smell and taste, preferably also dye the spirit some color which would make it unmistakable for alcohol suitable for human consumption, shall not interfere with the use of the spirit for illumination, heating, or power-generating purposes, and shall be absolutely non-neutralizable and not extractable from the denatured spirit, by either mechanical means — as filtering — or chemical treatment.

Statistics of the Countries of the World

Countries	Population	Sq. Miles	Capitals.
China	426,447,000	4,218,401	Peking.
British Empire*	396,968,798	11,146,084	London.
Russian Empire	129,004,514	8,660,395	St. Petersburg.
United States	†76,303,887	3,602,990	Washington.
United States and Islands	‡89,000,000	3,756,884	Washington.
Philippines	8,000,000	143,000	Manila.
Porto Rico	953,243	3,600	San Juan.
Hawaii	154,001	6,740	Honolulu.
Tutuila, Samoa	5,500	54	.....
Guam	9,000	200	.....
France and Colonies	65,166,967	3,250,000	Paris.
France	38,641,333	204,092	Paris.
Colonies	21,448,064	2,923,679	.....
Algeria	4,790,000	184,474	Algiers.
Senegal, etc.	183,237	580,000	St. Louis.
Tunis	1,900,000	45,000	Tunis.
Cayenne	26,502	46,697	Cayenne.
Cambodia	1,500,000	40,530	Saigon.
Cochin-China	2,323,499	23,160	.....
Tonquin	12,000,000	119,660	Hanoi.
New Caledonia	62,752	7,624	Noumea.
Tahiti	12,800	462	.....
Sahara	1,100,000	1,550,000	.....
Madagascar	3,500,000	28,500	Antananarivo.
German Empire, in Europe	58,549,000	208,830	Berlin.
Prussia	34,472,509	134,603	Berlin.
Bavaria	6,176,057	29,282	Munich.
Saxony	4,202,216	5,787	Dresden.
Wurtemberg	2,169,480	7,528	Stuttgart.
Baden	1,867,944	5,821	Karlsruhe.
Alsace-Lorraine	1,719,470	5,600	Strasburg.
Hesse	1,119,893	2,965	Darmstadt.
Mecklenburg-Schwerin	607,770	5,137	Schwerin.
Hamburg	768,349	158	.....
Brunswick	464,333	1,425	Brunswick.
Oldenburg	399,180	2,479	Oldenburg.
Saxe-Weimar	362,873	1,387	Weimar.
Anhalt	316,085	906	Dessau.
Saxe-Meiningen	250,731	953	Meiningen.
Saxe-Coburg-Gotha	198,717	760	Gotha.
Bremen	180,443	99	.....
Saxe-Altenburg	161,129	511	Altenburg.
Lippe	123,250	472	Detmold.
Reuss (Younger line)	112,118	319	Gera.
Mecklenburg-Strelitz	98,371	1,131	Neu Strelitz.
Schwarzburg-Rudolstadt	83,939	363	Rudolstadt.
Schwarzburg-Sondershausen	73,623	333	Sondershausen.
Lubeck	76,485	115	.....
Waldeck	56,565	433	Arolsen.
Reuss (Elder line)	53,787	122	Greiz.
Schaumburg-Lippe	37,204	131	Buckeburg.
German Africa	5,950,000	822,000	.....
Austro-Hungarian Empire	46,973,359	264,595	Vienna.
Japan	44,260,604	147,669	Tokio.
Netherlands	5,103,924	12,680	The Hague.
Netherlands and Colonies	33,042,238	778,187	The Hague.
Borneo	1,073,500	203,714	.....
Celebes	2,000,000	72,000	.....
Java	21,974,161	50,848	Batavia.

Statistics of the Countries of the World

(CONTINUED)

COUNTRIES	Population	Sq. Miles	Capitals.
Moluccas	353,000	42420	Amboyna.
New Guinea	200,000	150,755	.....
Sumatra	2,750,000	170,744	.....
Surinam	57,141	46,060	.....
Turkish Empire	33,559,787	1,652,533	Constantinople.
European Turkey	4,790,000	63,850	.....
Asiatic Turkey	16,133,900	729,170	.....
Tripoli	1,000,000	398,873	Tripoli.
Bulgaria	3,154,375	37,860	Scfia.
Egypt	9,700,000	400,000	Cairo.
Italy	32,449,754	110,665	Rome.
Italy and Colonies	34,970,785	425,765	Rome.
Abyssinia	4,500,000	189,000	.....
Eritrea	660,000	56,100	.....
Somal Coast	210,000	70,000	.....
Spain	17,550,216	196,173	Madrid.
Spanish Africa	437,000	203,767	.....
Spanish Islands	127,172	1,957	.....
Brazil	18,000,000	3,218,130	Rio Janeiro.
Mexico	13,546,500	767,316	City of Mexico.
Korea	10,519,000	85,000	Seoul.
Congo State	8,000,000	802,000	.....
Persia	7,653,600	636,000	Teheran.
Portugal	5,428,659	36,038	Lisbon.
Portugal and Colonies	11,073,681	951,785	Lisbon.
Portuguese Africa	5,416,000	841,025	.....
Portuguese Asia	847,503	7,923	.....
Sweden and Norway	7,376,321	297,321	.....
Sweden	5,136,441	172,876	Stockholm.
Norway	2,239,880	124,445	Kristiania.
Morocco	6,500,000	314,000	Fez.
Belgium	6,069,321	11,373	Brussels.
Siam	5,700,000	280,550	Bangkok.
Roumania	5,376,000	46,314	Bucharest.
Argentine Republic	4,800,000	1,095,013	Buenos Ayres.
Colombia	4,600,000	331,420	Bogota.
Afghanistan	4,000,000	279,000	Cabul.
Chile	3,110,085	256,860	Santiago.
Peru	3,000,000	405,040	Lima.
Switzerland	3,312,551	15,981	Berne.
Bolivia	2,500,000	472,000	La Paz.
Greece	2,433,806	24,977	Athens.
Denmark	2,417,441	14,780	Copenhagen.
Denmark and Colonies	2,288,193	101,403	Copenhagen.
Iceland	72,445	39,756	Rejkjavik.
Greenland	9,780	46,740	Godthaab.
West Indies	33,763	118	.....
Venezuela	2,444,816	566,159	Caracas.
Servia	2,096,043	18,757	Belgrade.
Liberia	2,060,000	35,000	Monrovia.
Nepaul	2,000,000	56,800	Khatmandu.
Cuba	1,600,000	44,000	Havana.
Oman	1,600,000	81,000	Muscat.
Guatemala	1,574,340	46,774	N. Guatemala.
Ecuador	1,300,000	144,000	Quito.
Hayti	1,211,625	9,830	Port au Prince.
Salvador	915,512	7,228	San Salvador.
Uruguay	840,725	72,112	Montevideo.
Khiva	700,000	22,320	Khiva.

Statistics of the Countries of the World

(CONTINUED)

COUNTRIES	Population	Sq. Miles	Capitals.
Paraguay	600,000	145,000	Asuncion.
Honduras	420,000	42,658	Tegucigalpa.
Nicaragua	420,000	51,660	Managua.
Dominican Republic	600,000	20,596	San Domingo.
Costa Rica	309,683	19,985	San Jose.
Panama	285,000	31,571	Panama.
Montenegro	245,380	3,486	Cettinje.

*These estimates of the population and area include the recently acquired great possessions in Africa. †Census of 1900. ‡Estimated for January 1, 1904.

COUNTRIES.	Estimated Population.
British Empire:	
Australasia	5,500,000
Canada	5,400,000
Cape Colony	2,400,000
Great Britain	41,600,000
India	295,200,000
So. African Republic	1,200,000

Population of the United States
by States and Territories, 1900

Alabama	1,828,697	Missouri	3,106,665
Alaska	63,592	Montana	243,329
Arizona	122,931	Nebraska	1,066,300
Arkansas	1,311,564	Nevada	42,335
California	1,485,053	New Hampshire	411,588
Colorado	539,700	New Jersey	1,883,669
Connecticut	908,420	New Mexico	195,310
Dakota	....	New York	7,268,894
Delaware	184,735	North Carolina	1,893,810
District of Columbia	278,718	North Dakota	319,146
Florida	528,542	Ohio	4,157,545
Georgia	2,216,331	Oklahoma	398,331
Hawaii	154,001	Oregon	413,536
Idaho	161,772	Pennsylvania	6,302,115
Illinois	4,821,550	Rhode Island	428,556
Indiana	2,516,462	South Carolina	1,340,316
Indian Territory	392,060	South Dakota	401,570
Iowa	2,231,853	Tennessee	2,020,616
Kansas	1,470,495	Texas	3,048,710
Kentucky	2,147,174	Utah	276,749
Louisiana	1,381,625	Vermont	343,641
Maine	694,466	Virginia	1,854,184
Maryland	1,188,044	Washington	518,103
Massachusetts	2,805,346	West Virginia	958,800
Michigan	2,420,982	Wisconsin	2,069,042
Minnesota	1,751,394	Wyoming	92,531
Mississippi	1,551,270		
Total			†76,303,387

Population Continental United States (including Alaska), 76,149,386 (1900); Philippines, 8,000,000; Porto Rico, 953,243; Hawaii, 154, 001; Guam, 8,661; American Samoa, 5,800. Total population, 85,271,093. Population 1904, estimating Continental United States, about 90,000,000.

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Mr. Parker, on November 1, 1903, after having been a member of the Examining Corps of the U. S. Patent Office for over five years, resigned his position as Examiner to take up the practice of patent law.

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My experience in giving testimony as an Expert before the Courts enables me to draw claims that will stand in the Courts, and I not only get patents for my clients but get them with good and sound claims. I studied patent law at the Columbian University, am properly registered in the Patent Office as a Patent Attorney, and am a member of the Patent Law Association.

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